

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

INSTITUTE OF DISTANCE LEARNING



**RELATIONSHIP BETWEEN INFORMATION AND COMMUNICATION
TECHNOLOGY (ICT) AND THE PERFORMANCE OF LOGISTICS COMPANIES IN
KUMASI, GHANA**

By

REUBEN NARTEY

JAUNARY, 2022

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KUMASI, GHANA**

By

Reuben Nartey, B.Sc. (Hons)

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A THESIS SUBMITTED TO THE INSTITUTE OF DISTANCE LEARNING, OF THE
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SCIENCE IN SUPPLY CHAIN

JANUARY, 2022

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature..... Date.....

Name: Reuben Nartey

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the Kwame Nkrumah University of Science and Technology

Supervisor's Signature..... Date.....

Name: Dr. Seth Nkrumah

ABSTRACT

The study examines the relationship between Information and communication technology (ICT) and the performance of logistics firms in Kumasi, Ghana. The main objective of the study was to gain a better insight into how the ICT practices such as Bar-coding, Radio Frequency Identification, Enterprise Resource Planning and Materials Resource Planning affects the firms' performance. Seventy four (74) logistics firms in Kumasi consisted the research sample. The sample population included the managers, directors, supervisors and staff that are in direct contact with ICT usage. In order to achieve the objective, 147 questionnaires were distributed, and 129 questionnaires were filled and retrieved for analysis. This represented a response rate of 87.8% of the sampled population. The researcher analysed the data obtained using SPSS version 26. Descriptive statistics methods were employed to present and summarize the findings of the result. The researcher further analyzed the data using inferential statistics and multiple regression. The study showed that ICT positively relate to performance of the logistics firms in Kumasi, Ghana. The findings revealed that three out of the four ICT indicators used as the independent variables of the research were found to be statistically significant, which were enough to influence the performance of the logistics firms. The researcher recommends that management should continue to motivate and increase ICT usage within the firms and even to the sectorial level that are yet to be computerized to achieve a higher level of optimum operation and profitability.

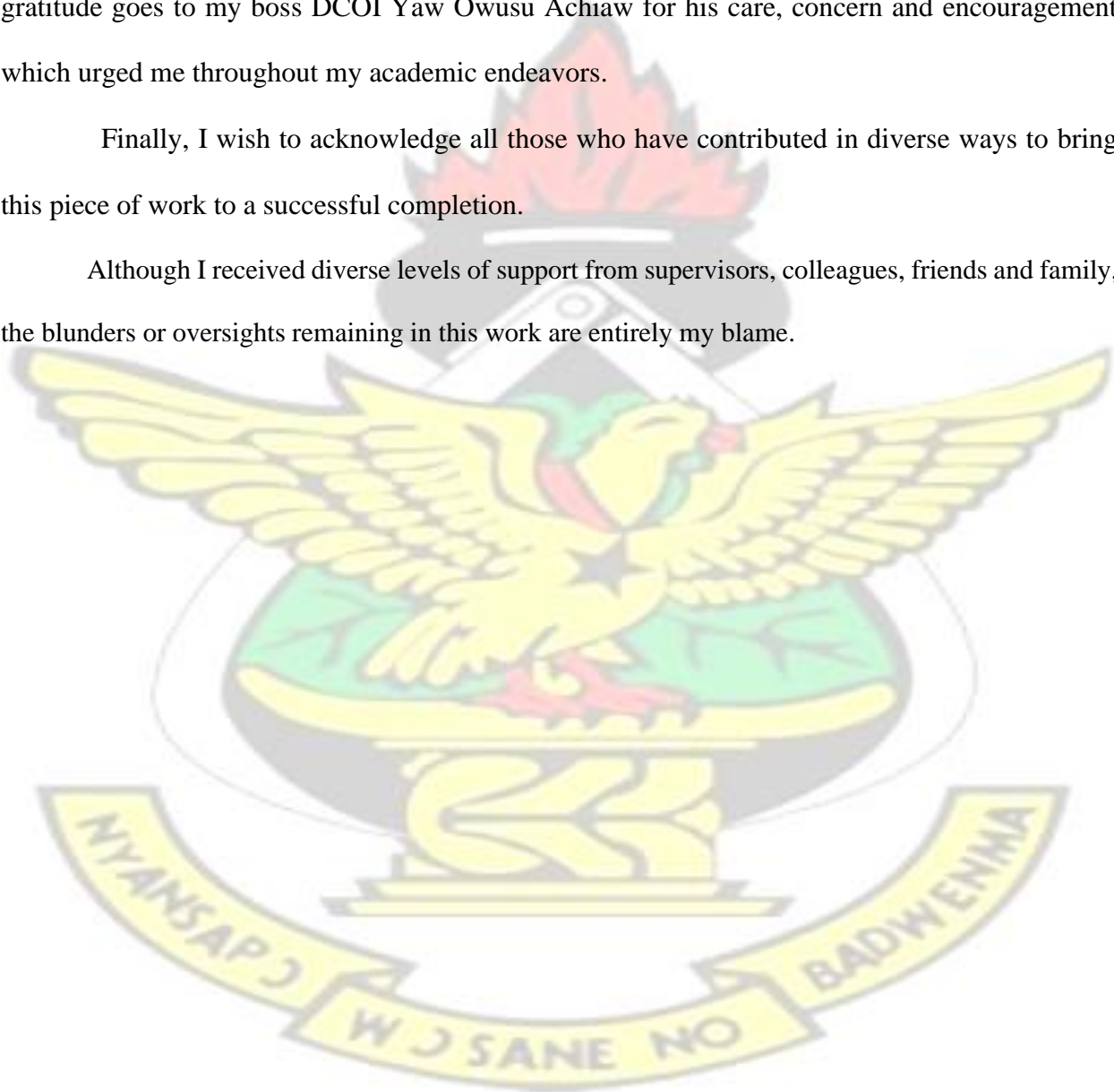
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Although I received diverse levels of support from supervisors, colleagues, friends and family, the blunders or oversights remaining in this work are entirely my blame.



DEDICATION

To my beloved wife Mrs. Eunice Ama Odaaba and my lovely son Reuben Nartey Jnr.

KNUST



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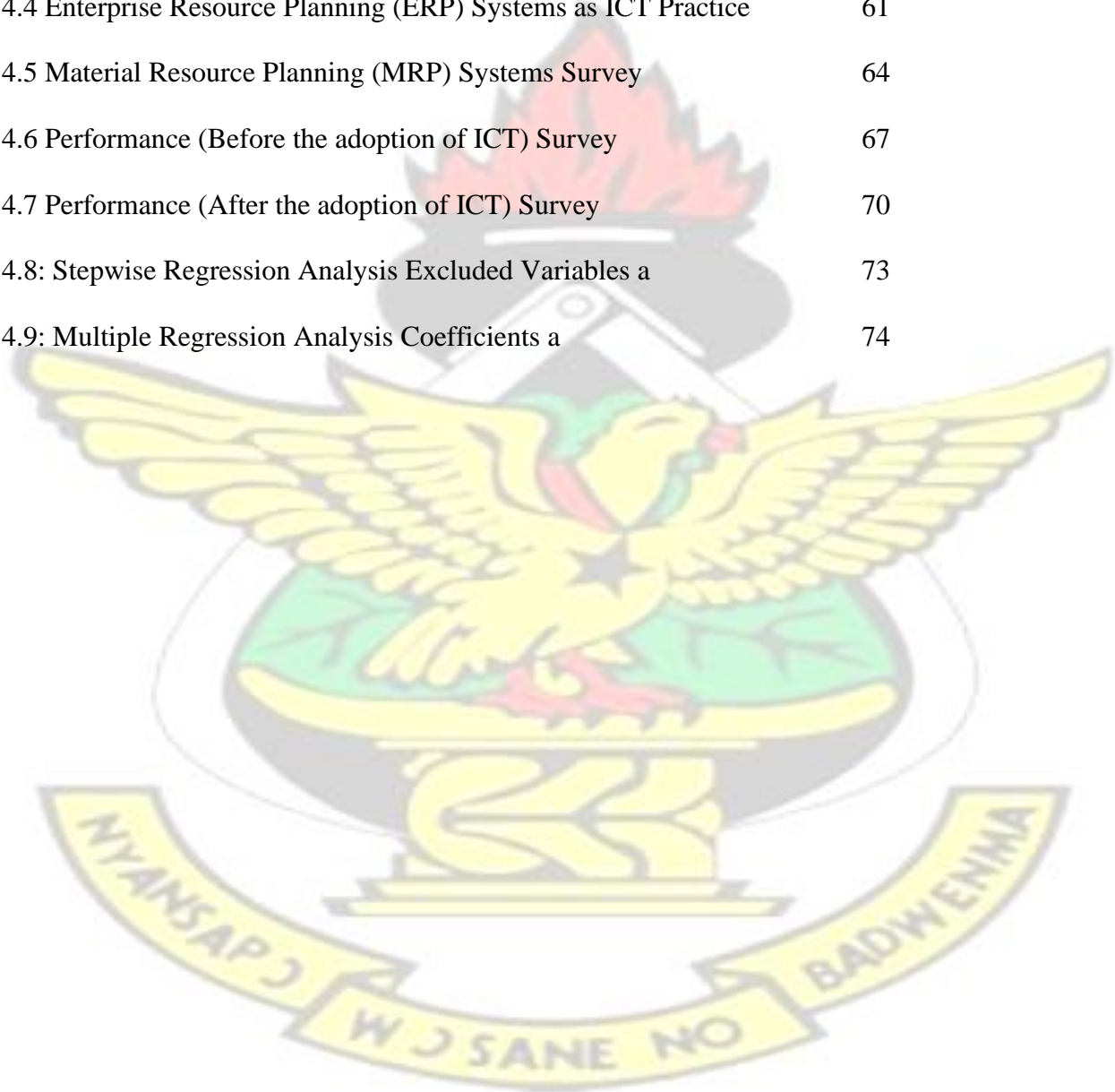
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LIST OF ACRONYMS

CCTV	Close-circuit Television
ERP	Enterprise Resource Planning
GNSW	Ghana National Single Window
ICT	Information and Communication Technology
IT	Information Technology
LIP	Logistic Performance Index
MNCs	Multinational Companies
MRP	Material Resource Planning
RBV	Resource Based View
RFID	Radio Frequency Identification
ROA	Return on Assets
SC	Supply Chain
SCM	Supply chain
SME's	Small and Medium-scale enterprises

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The world is rapidly advancing in science and technology in the modern world. Every day, getting rid of technology becomes more difficult (Yusuf, Sodiq, Giwa, Eke, Pikuda, De Luca, Di Salvo and Chakraborty, 2020). The various technical equipment that most people and companies utilize in their everyday lives and businesses are admired by most people and businesses. The spread of new electronic business and ICT amongst enterprises is a current example of technical change dynamics and economic development. New ICT technologies undeniably provide them a competitive edge (Costa, and Castro, 2021).

The Ghanaian government announced the release of a new digital strategy in May 2019 (Adarkwah, 2021). This is part of a larger plan to turn the nation into a prominent ICT innovation hub in Sub-Saharan Africa. It demonstrates that Ghana is quickly adopting new developing technology in all of its operations, including logistics (Karakara, and Osabuohien, 2020). Businesses in the logistics and transportation industries have made significant progress in adopting new technologies in recent years, particularly those related to e-business and the internet. ICT technologies aid in the speeding up of activities, the encouragement of computerized decision-making actions and developments, and the facilitation of supply chain operations (Rejeb, Keogh, Simske, Stafford, and Treiblmaier, 2021).

In the past few years, commercial development has been attributed to innovations. As technological advances continue upsurge, logistics companies look for ways to improve their client retention and growth (Bag,Gupta, and Luo, 2020). These modern inventions help businesses improve their quality and productivity, allowing them to improve their consumers experience and

gain a competitive advantage over their rivals. According to Karim, (2020) the introduction and usage of ICT is assisting logistic enterprises in living their dreams by fostering improved customer interactions and fulfillment, lowering costs, improving communication, reducing transactional duration, providing protection, and improving overall efficacy and performance. According to research on Ghana's logistic performance index, the country's logistics value increased in 2014, with an index of 2.66 compared to 2.63 in 2013, thanks to the Ghana National Single Window (GNSW) initiative (Bossey, 2022). This initiative employed the Unified Computerized Machine paradigm, an Information technology platform for the fusion of current systems and the modernization of existing infrastructures as needed. Nevertheless, the World Bank's LIP review in 2018 revealed that Ghana's logistics performance had declined from 2.66 in 2016 to 2.57 in 2018. Given the numerous advantages of Information Communication Technology acceptance in logistic industries, research have revealed that consumers have not fully appreciated these gains. It has been discovered that a number of businesses do not rise to the needed level, causing further harm to investors, consumers, and other users. Poor technological decisions, vulnerability, complexity, and insufficient information exchange plague logistics companies. To reduce inefficiencies, the correct technology and employees must be chosen for the primary activities of logistics organizations (Bag et al., 2020). To ease the speed of operations, logistic companies must employ the appropriate infrastructure. To develop openness and improved customer relations amongst all parties engaged in a transaction, effective information exchange is critical.

When examining the adoption of Information Communication Technology in light of its goals, there is less emphasis on the value of technology offered and more on how well it fits the requirements of future users. As a result, the purpose of this research is to assess the influence of Information Communication Technology on the performance of logistics enterprises in Kumasi,

Ghana, in order to understand its impact on their functions and processes and to ensure their development potential.

1.2 Statement of the Problem

Over time, the development of the internet and progressions in digitalization have resulted in increased system performance in the stipulation of actual information, accessibility, information communicating and sharing, greater coordination and dialogues, logistics, and also other supplier management (Onyema, Deborah, Alsayed, Noorulhasan, and Sanober, 2019). These developments have had an influence on the process and efficiency of logistics management, as well as the relationships between logistics actors such as supply chain partners. In numerous businesses or regions, logistics management performs varied functions (Ashrafi, Ravasan, Trkman, and Afshari, 2019). As a result, many people have realized the value of ICT in logistics activities. In addition, the area of information and communication technology has aided in the globalization of processing and marketing networks in numerous industrial plants. According to Chen, (2018), information systems have been acknowledged to drive international trade supply chain to generate competitive edge for competitive strategy, since many firms participate in logistics activities in the rapidly changing business environment.

According to 168 merchants in a worldwide study, ICT prices (infrastructure, programming, telecommunication, and IT operations) increased by 40% in 2019 (Bossey, 2022.). Order placing, stock control, shipments, transmission of data with suppliers, e-payment data dissemination with vendors, mobile connection, and virtualized operations are all sectors where ICT infrastructure services are heavily employed.

According to Tien, Anh, and Thuc, (2019) ICT technologies have grown increasingly prevalent in the development of logistics in organizations looking to reduce overhead expenses and become tax benefit retailers. Mechanization in logistics activities has been influenced by information and communication technology. Nevertheless, in Ghana, the usage of information and communication technology in logistics enterprises is still in its early stages (Coffie, Hongjiang, Mensah, Kiconco, and Simon, 2021). Despite the multiple advantages associated with the development and use of technology system, Ghana has been hesitant to embrace ICT tools for leadership and management logistics. Since the onset of globalization, which has linked up the local economy to the rest of the globe, logistics management has become more important. Companies in Ghana, on the other hand, are unaware of the importance and advantages of Supply chain . It may be claimed that the usage of ICT in logistics activities is uneven.

Information systems provide chances and advantages for logistics management in Ghana. As a result, there is a need to explore the influence of information and communication technology on logistics management and the potential for ICT to assist these administrators in enhancing supply chain performance, operating efficiency, and developing competitive supply chains.' This study focuses on the direct impact of information and communication technology (ICT) on company performance in areas such as security and tracking, customer support performance, system integration, and Information technology utilization in logistics management. This research may help logistics leaders to greatly understand how ICT tools might help logistics operations in Ghana.

1.3 Research objectives

1. To evaluate on logistics businesses use information and communication technologies.

2. To examine the Kumasi metropolitan area's logistics performance efficiency.
3. Determine the relationship between information communication technology activities and performance of logistics companies.

1.4 Research Questions

1. What information and communication technologies do logistics business use in Kumasi metropolitan area?
2. What is the logistics performance efficiency of Kumasi metropolitan area?
3. What is the relationship between information communication technology activities and performance of logistics companies in Kumasi metropolitan area?

1.5 Significant of the Study

Company owners of logistics companies will benefit from the results of this study because it provides a greater understanding of the influence of (ICT) on logistics performance, allowing them to make smart business decisions for company success. It will also serve as a wake-up call for investors to begin investing in logistics enterprises in order to boost economic development. The results will also be beneficial to the country, since they will provide valuable insight into the country's future ICT services.

The outcomes of this research are intended to add to the limited number of studies and field of knowledge by offering a comprehensive insight into the role of ICT on the logistics performance of enterprises in Kumasi, Ghana. Given the scarcity of research in this field, this research will give a broad understanding of ICT and company logistics performance in Ghana. The work will also provide a fertile ground for additional academic investigation. This will be useful for researchers

and academics in logistics and Supply chain to assess and analyze any flaws that may not have been covered in this study. The study's findings are also expected to assist logistics managers in better understanding the implications of Information communication technology on logistics activities. The findings of this research will be used by policymakers to address particular difficulties in logistics and supply chain performance.

1.6 Scope of the Study

The research focused on the influence of ICT on business logistics performance. The survey was also limited to leaders, executives, administrators, managers, and workers of Kumasi-based logistics operations and distribution logistics enterprises that have direct interaction with ICT use. The research focused only on the influence of ICT on logistics management in terms of monitoring and tracking systems, customer relations performance, information integration systems, and ICT use in logistics management. The study did not look at the hurdles and constraints to ICT uptake and usage, or how these obstacles might affect Supply chain innovation for competitive edge. As a result, no link was found between the innovation element, the Supply chain aspect, and ICT tools.

1.7 Overview of the Research Methodology

The study adopts quantitative, descriptive and case study research approach to understand the phenomenon that exist between ICT practice and logistic performance among firms in the Kumasi Metropolitan. The targeted population is the employees, including junior and senior staff at the of some selected firm. The Study adopts a simple random technique to select the sample size. Primary source of data is used to collect respondent data through administered questionnaires. The research

uses SPSS version 26 and PROCESS MACRO module to analyse the descriptive, correlation, reliability, regression and mediation analysis between the study variables.

1.8 Limitations of the study

One of the study's limitations is that respondents will most likely be hesitant to respond to questions. Furthermore, the researcher concluded that the information presented may not be genuinely indicative of the situation on the ground since respondents would wish to distort their comments to get a good conclusion owing to the industry's exclusivity.

To address this constraint, the researcher attempted to convey the significance of improving logistic performance in the industry and Ghana in particular through study.

1.9 Organization of the Study

Chapter one is sectioned into eight subsections. It begins with the background, followed by the statement of problem statement; research objectives, research questions, the significance of the research, brief methodology and the study limitations. The Chapter two of the study presents relevant literature that are linked to the research topic been explored. Also, chapter two provides the theoretical background and the conceptual framework of the study that explains the relationship among the study variables. On Chapter three, the methodology used by the researcher is presented with valid details and the respondents who partook in the research. Chapter four presents comprehensive data analysis of the research, results and discussion of findings. Finally, chapter five presents summary of the study findings, conclusions and recommendations from the findings.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This part examines the relevant literature reviews that are related to the study topic. The conceptual review part examines the study's numerous topics, such as information and communication technology and logistics management. Significant theories relevant to the research, as well as empirical evaluations on previously comparable studies connected to the study, are both understudied. Finally, a conceptual framework has been created to depict the study's overall graphical representation.

2.2 Conceptual Review

2.2.1 Supply chain (SCM)

Supply chain is described as optimizing the steps used to transport commodities from raw ingredients to finished products (Kaur, Singh & Singh, 2019). Companies that offer goods to end users are known to as the supply chain because they reflect a coagulated effort (Yalcin, Shi & Rahman, 2020). When the supply chain has been in place for a long time, most businesses simply give heed to what occurs inside their companies. Further aspects of Supply chain include logistics, purchasing, information technology, and procurement (Tarofder et al., 2019).

The SC includes a variety of operations such as product innovation, logistics, procuring, and manufacturing, as well as a communications network to manage these operations (Kulkarni & Halder, 2020). Likewise, it is the control of information system-directed operations from procuring through manufacturing, product creation, and transportation with order to optimize service quality.

Supply chain, according to the researchers, brings all assets, knowledge, procedures, equipment, and planning to build, keep, and deliver completed items to consumers (Dolumbia et al., 2021; Emmanuel, Dauda & Kemevor, 2022).

Supply chain is described as the structure, implementation, supervision, tracking, and forecasting of supply chain activities with the goal of producing new value (Emmanuel, Dauda & Kemevor, 2022), developing a sustainable network, coordinating market forces, and assessing performance globally (Adegoke et al., 2021). The implementation of the information systems with supply chain stakeholders' relationships, such as individuals in the organization, providers, merchants, vendors, and distribution hubs, is the emphasis of Supply chain (Damoah, Ayakwah & Tingbani, 2021). The goal of this unification is to increase efficiency by cutting costs and boosting revenues. It's crucial to remember that SCM combines planning and implementation management with activities, manufacturing, logistics, shipping, and deliveries (Hofmann et al., 2019; Kulkarni & Halder, 2020).

Businesses are often considered as members of multi-company, inter networks in today's climate. IT plays a critical role in a company's supply chain operations (Amoako et al., 2021). In Africa, the supply chain is a relatively young area, and several businesses engage in global commerce. In pace with the fast and complicated corporate world, an improved supply chain is essential (Damoah, Ayakwah & Tingbani, 2021). Companies continue to purchase materials for production and even to supply to consumers at the appropriate time and cost (Mallet, Kwateng & Nuerthey, 2022). Organizations must enhance their adaptability and reactivity in attempt to optimize their business. This will be accomplished through altering activities, techniques, and technologies, including the use of the supply chain concept and information and communication technology (Agyei, Koomson & Akraasi, 2021).

Companies require Information And communication technologies in terms of managing Supply chain (Coffie et al., 2022; Ansah & Akipelu, 2021). Using these systems, it is necessary to boost information exchange across the supply chain. Businesses may now do work for companies beyond their purview as smoothly and successfully as they can with several other businesses inside their reach advent of the internet and associated latest technology (Maluleke et al., 2021; Nazir, Vervoort & Reddy, 2021).

Technological Innovation is used by businesses in a variety of techniques. Information technology is typically one of the most effective strategies to reduce expenses while simultaneously improving the performance of a company (Baba et al., 2021; Maluleke et al., 2021). Numerous major companies utilize IT to coordinate procedures across their supply chain. Pipeline purchasing, internal manufacturing, cascade sales, customer support, and information exchange are all examples of these processes (Nazir et al., 2021). IT is used in a variety of supply chain tasks. Using the internet to purchase and obtain materials is one of these actions . Companies may perform commercial business electronically using E-business technology. This covers documentation transfers such as requests, bills, and settlements (Baba et al., 2021). Firms employ technology tools such as CRM, RFID, and warehouse management systems to connect supply chain activities (Nurlaelah, 2022).

A completely fresh supply chain alternative has been made possible by the development of the internet and business applications. Organizations involved in the supply chain employ information technology to conduct their business (Appah et al., 2022). The firms use enterprise software systems like count and analytics to integrate tasks like finance, manufacturing, inventory management, and procurement. Companies also share computer files including bills, RFQs, customer orders, and freight forwarding through electronic forms. Extranets and the internet are

also used to share information among workers, administration, vendors, and clients (Fianko et al., 2022; Appah et al., 2022).

These businesses employ automated delivery, which allows them to trace their goods in instantaneously. When monitoring deliveries, they frequently get updates such as the whereabouts, volume, and quantity of parcels (Appah et al., 2021). They may also communicate information about goods and their destinations across various locations. Most of this IT utilization aids these businesses in increasing their adaptability and lowering supply chain expenses. Information technology is also being used by major Africa retailers in various supply chain operations (Fianko et al., 2022). They detect items via barcode scanner. At the cashier's counter, companies also employ computerized POS. In stores, CCTV cameras are also used to monitor criminals (Agyei-Owusu, et al., 2021)

2.2.2 Information and Communication Technology (ICT)

Information and communication technology is a critical component of every organization's growth (Arkorful, Barfi & Aboagye, 2021). Any organization's strategy has grown more important as information and communication technology has become more important (Nyarko & Kozári, 2021). Information and communication technologies are systems that concentrate on communicating and provide information access (Qazi et al., 2021). In the company, information and communication technology is utilized to accomplish a variety of functions planning and management, payment services, and strategic planning. Other definitions of information and communication technology (ICT) include the components and infrastructure needed for modern processing data (Nyarko & Kozári, 2021; Qazi et al., 2021). It allows people and organisations to interact with the virtual

world. As a subset of computer technology that makes use of telecommunications, information and communication technology (ICT) is referred to (Okoampa-Larbi et al., 2021).

Digital transformation has become synonymous with information and communication technology in past few years. As a communications system resource, information and communication technology is required for the coordination and cooperation between companies and marketplaces in order to build a company-customer exchange (Seth & Xiaofang, 2021). The use of the website, internet technology, smart phones, and wireless connections for exchanging data, pooling, and getting accurate data to aid productivity is known as information and communication technology (Owusu-Sekyere & Darkeh, 2022). The researchers also note that information and communication technology encompass infrastructure, applications, IT solutions, internet, and connectivity to serve as a crossroads for various technologies to give actual data accessibility (Liu et al., 2021). From the aforementioned perspectives, it can be concluded that information and communication technology emphasize on communication devices and services that provide digital data exchange and transfer for local and global interaction (Appiah, 2021).

The world wide web world as well as mobile devices driven by wireless technologies are included in information and communication technology. It also includes archaic technology such as landlines, broadcast media, and audio (Attuquayefio, 2022). It is stated that the aforementioned technologies, as well as competitive advantage information and communication technology items such as AI and robotics, are still widely employed (Hailegebreal et al., 2021). It could refer to the widely recognized and quickly expanding area of IT, and it can be inferred that this sector is extremely broad and includes a wide range of products and services (Jimoh et al., 2022). ICT's primary responsibilities are to give its goods and services to its consumers with the features that these solutions demand for their business processes. As a result, computer networks are often the

shippers of functionality (Amoah, Osei-Tutu & Adjei, 2022). Users of capability, from the aforementioned viewpoint, include not only companies, customers, partners, firm personnel, and other entities, but also certain other technologies.

As a result, ICT tools aid in the speedier execution of activities, the support of automated decision-making operations, and the facilitation of market-based activities in order to improve logistical efficiency (Fekpe & Fiagbey, 2021). In certain ways, using information and communication technology devices fixed working more visible to interested parties, which might translate into improved company operations being adopted to satisfy customer service requirements (Owulaku & Tetteh, 2022). Any corporation wishes to have information and communication technology tools that aid in the manufacturing process, sales, supply chain integration, and user feedback, allowing it to gain popularity and, as a result, reduce corporate expenses while reaping massive returns (Ahoa et al., 2021). Supplies are bought and things are manufactured onto one or many manufacturers, then delivered to warehouses for temporary holding before being transferred to merchants or enterprise customers (Bassa, Kwateng & Kamewor, 2021).

The firms and business ventures required to design, develop, distribute, and utilize an item or service are referred to as supply chains (Kwateng et al., 2021). Companies want their supply chains to give them with the information they need to continue operating and succeeding. Stock control inaccuracies are significant in supply chain. Despite the fact that many businesses have mechanized their stock control using ICT technologies, stock levels in information management and actual stock levels often differ. The disparity among these sales volumes is known as inconsistency, and it may have a significant impact on a company's success (Fekpe & Fiagbey, 2021; Ahoa et al., 2021; Owulaku & Tetteh, 2022).

2.2.3.1 Bar-coding in ICT

A barcode is a computer-readable representation of data (Mogbojuri, Olanrewaju & Ogunleye, 2022). Barcodes used to hold information in the heights and spacing of printed vertical lines, but today barcodes come in a variety of designs, including dots, concentric circles, and textual coding (Oyanedel, Gelcich & Milner-Gulland, 2021). Optical scanners, often known as barcode readers or scanners, can interpret codes. Fully automated tracking devices that increase the time and efficiency of digital data entering often employ barcodes (Antony, Khanapuri & Jain, 2021). Bar-coding allows items and information to move more quickly across a company. Automated classification of packages and bags on trolleys and palletizers, industrial tracking, computerized logistics operations, including processing, set aside selection, and dispatching, shipping information, access management, and number of tracking are all examples of where barcoding may be employed (Suu-Ire et al., 2022).

Minimizing operational expenditures, using barcodes to monitor these things may deliver a good return on investment (Antony, Khanapuri & Jain, 2021). When these things are not properly maintained, barcodes often get misplaced at client premises and are not quickly returned (Charlebois et al., 2021). As per Zebra Corporation (2004), this leads to businesses buying more "resealable bins to guarantee customers have an appropriate supply," resulting in excess volume and cash being locked into fixed assets. Businesses may use barcode technology to track items forever and read products to capture information and location data as they transit into or out of locations (Mogbojuri, Olanrewaju & Ogunleye, 2021).

More sophisticated management and risk control capabilities result from stock control procedures (Braga et al., 2021). When a result, as businesses begin to "computerize and apply Just-In-Time, Total Quality Control, and Computer Integrated Manufacturing in the monitoring of their

activities, bar code will become the hearts and organs that transport that information (Lalitha et al., 2017). Barcodes carry internal data such as deadline, model number, components used, and other quality check information when utilized for efficiency and production reasons (Maringer et al., 2019). Businesses may scan these barcodes as shipments depart their transportation division and record accurate product data efficiently, including destination information. Tiny barcodes are used as part of Motorola's quality management in the production process to properly assess components, according to the company (Nishitha et al., 2019).

Barcodes have been used by various industries and deployed across the supply chain since their creation over three decades (Lekhaa et al., 2019). In reality, barcodes have developed to fulfill the needs of warehouse, delivery services, bookkeeping, and customer support operations across the entire company (Deng et al., 2019). "Bar coding is a reliable, well-established technique," Singer says, citing the fact that barcodes are read over 10 billion occasions every day throughout the globe (Maringer et al., 2019). Numerous businesses, particularly those with allocation activities, have embraced barcoding systems and spent significant resources in facilities and associated systems. Before justifying investment in an emerging method, such businesses would need to properly analyze the merits of some other auto-ID system (Fan et al., 2019).

2.2.3.2 Radio frequency identification (RFID) in ICT

RFID stands for radio frequency identification and is utilized in production, warehousing, Supply chain , and stock control (McGugin et al., 2019). They're used to identify objects automatically. Radio frequency tags are employed in Radio frequency identification systems to communicate permanent information (Cui et al., 2019); the tags represent a special serial number to distinguish each item (Alsharif et al., 2019). The data broadcast by RFID may be automatically read. Airports,

freight businesses, haulers, and industrial enterprises with greater commodities often use radio frequency identification technologies. In the delivery of shallow items lifespan, radio frequency identification helps to increase efficiency and productivity and inventory control clarity (Zradziński et al., 2019; Cui et al., 2019). Radio Frequency Identification also aids in the management of flying freight.

A silicon chip with an identifying number and a transmitter capable of transmitting the amount to a reading device make up an RFID tag (Ali & Haseeb, 2019). This entails stock control, restocking, and restocking methods, which leads to fewer interruptions in operations and lost revenues as a consequence and are out of inventory. Radio frequency identification is a critical information technology for BOSC since it improves speed and reliability (Cui et al., 2019). Radio frequency identification allows for mass reading, which allows for a large number of tags to be scanned in a brief span of time; a common scan speed is dozens of tags per second, and the tags may be scanned for a very long distance, sometimes several of yards in the event of customized tags (Jardine et al., 2019). Radio frequency identification tags are tough because they may be damaged and dirty without losing their functionality. Radio Frequency Identification might do a large number of readings in a matter of minutes. All of these factors contribute to the supply chain's overall success (Wessels et al., 2019).

Recent years have witnessed a surge in the use of RFID, a comparatively recent technology, in logistics management (Wazir et al., 2020). This system has the ability to recognise, classify, and control how goods and information travel along a supply chain. It has the ability to significantly enhance supply chain performance by providing efficient and reliable information that boosts supply chain transparency and management. The use of RFID in the supply chain has grown (Flanagan & McGovern, 2022).

2.2.3.3 Enterprise resource planning systems in ICT

A contemporary business management approach is an enterprise resource planning system (Hasan et al., 2019). It is built on a computer-assisted data management system. ERP's main goal is to incorporate a broad variety of data about corporate assets in order to generate efficiencies with key stakeholders, satisfy consumer demands, and boost efficiency (AboAbdo et al., 2019). The services that are incorporated within the company might be regarded as an enterprise resource planning system. Universal flexible program is an enterprise resource planning solution (Wang et al., 2019). It is an information system that combines all aspects of production system, suppliers, manufacturing, marketing, transportation, bookkeeping, and customer support (Zeng et al., 2019). An ERP system is described as a portion of an ERP program that enables information to be shared across a network of firms, dealers, and clients with regard to geography. Information regarding sellers and buyers is provided in real time and in a consistent and accurate way (Chofreh et al., 2020). The reasons for establishing an enterprise resource planning system varied from company to company, the potential benefits of enterprise resource planning are diverse and hard to detect (Wang et al., 2019).

Organizational success and long-term competitiveness are built on enterprise resource planning tools and Supply chain methods (Aljawarneh & Al-Omari, 2018). Supply chain gives organizations useful tools for meeting the demands of suppliers, consumers, and rivals (Carlsson-Wall et al., 2021). System quality, information quality, system utilization, user happiness, individual effect, and organizational impact are all elements that might influence the ERP system's performance (Samiei & Habibi, 2020). During enterprise resource planning deployments, the choice of software/software vendor and/or consultant has a direct impact on the effectiveness of the enterprise resource planning and the vendor's great relationship with the organization.

Suppliers and specialists that specialize in enterprise resource planning may assist with the software's quality, involvement, and educating users (Alomari et al., 2018).

As a result, selecting the right system has an impact on system quality, as does selecting the right software provider and advisor (Tavana, Hajipour & Oveisi, 2020). In the scope of ERP systems, personal and organisational influence are unconnected. Nevertheless, via the actions of the individual and organizational affect workgroups, there is a strong correlation (Anguelov, 2021). In the case of a transition, social economic risk management is also an important aspect of effective company management. The safeguarding of ethical and corporate information resources is critical in lowering the hazards. As a result, risk security and compliance control aspects are critical in determining the system's effectiveness (Ursacescu et al., 2019).

ERP installations are seldom effective in enterprises lacking external help (resellers and installation specialists). ERP installation may reduce the likelihood of error in the resolution of conflicts, the creation of appropriate change frameworks, the definition of project management team goals, and the modification process (Taghipour et al., 2020).

A complete transaction control system that integrates various types of information processing skills and stores data in a central platform is known as an enterprise resource planning system (Ferrari et al., 2021). Enterprise resource planning (ERP) is an integrated company software package that drives a business information system and manages a wide variety of operations, from Supply chain to work line monitoring and accounting records (Njuaem & Smith, 2018). By offering a comprehensive effective approach for the business's information processing requirements, an enterprise resource planning system assists an enterprise to optimally oversee the usage of assets such as goods, personnel, and money. The ERP's main prospects are electronic business and Supply chain (Guo et al., 2021). With the integration of supply chain applications

with other company systems, customers may reduce turnaround time and stock. In need to do e-business, users go beyond the confines of their own firm to engage with suppliers, resellers, and customers more effectively (Adade-Boafo, 2018).

ERP is a business management system that integrates all divisions or departments of a company and is backed by several other modules (Aremu, Shahzad & Hassan, 2021). Often these ERP programs are constructed around a set of modules that may be used alone or in combination. These integrated modules or mode are; finance module records accounting reports such as receivables and payables, wages, and other accounting and managerial accounting data (Aremu, Shahzad & Hassan, 2021). Stock management operations, as well as delivery, are frequently sub-modules of the logistics component. The manufacturing module controls the movement of orders or products, as well as MRP and production development and collaboration. Supplier management keeps track of the whole sales cycle, from requesting through payout of vendors, as well as vendor fulfillment and effectiveness (Ghani et al., 2019). The human resource module also covers several aspects of human resource management, such as planning, orientation, and task allocation (ElFarmawi, 2019).

In order to improve supply chain effectiveness, an enterprise resource planning system is essential (Ghani et al., 2019). Stock turnover is significantly quicker because retailers and manufacturers can boost stock turns tenfold while lowering stock costs. In several instances, customer service has gotten better, and ERP systems can increase supply by providing consistent goods at the appropriate position within the specified timeframe, exceeding customer expectations and sense of achievement (Aremu, Shahzad & Hassan, 2021; 2020). ERP makes for improved stock control while requiring fewer audits, lowering necessity tangible audits. It also greatly reduces on installation time by helping individuals, tools, and machines are coordinated, as well as making

effective utilization of machinery and avoiding outage via efficient maintenance (Jayeola et al., 2020). ERP software produces energy performance with solid manufacturing components, continuously identifies quality concerns, and provides the data needed to enhance production levels while reducing waste and overtime (Tarigan, Siagian & Sebayang, 2020).

2.2.3.4 Material resources planning (MRP) in ICT

This is a strategy that aids in comprehensive production planning and has the essential specifications (Opoku et al., 2020): it is targeted particularly to production lines; it is a sales forecast technique; a computer-based framework. MRP's goal is to have bought or company-made components ready just in time for another stage of manufacture or shipment (Jayeola et al., 2020). It helps buying and control departments transport the proper materials to production and distribution sites at the correct moment. MRP is a method of inventory management for a multi-component production line. Because the model concentrates on a single final product inventory, the dependency across stock levels of various parts is ignored again (Anguelov, 2021).

An assembly system with unpredictable operation times. The goal is to select start schedules (release dates) for various activities in order to reduce the total estimated waiting and queue expenses (Asif, AlFrraj & Alshamari, 2022). In an MRP-controlled factory setting, delayed raw material deliveries, operation leadtime that vary, interoperation shift periods, and backlog processing times are all common. Instead of using the master production plan to depict such a scenario, researchers expressed need by intra timings (Samiei & Habibi, 2020).

A multi-component manufacturing process with unpredictable part leadtime and a predetermined completion deadline and volume (Bassa, Kwateng, & Kamewor, 2021). The goal is to reduce the overall cost of element withholding and product lateness by determining the date of each component order. The method assumes a definite demand for a single completed product at a

certain time (Owulaku & Tetteh, 2022). This product requires a variety of different components to put together. The goal is to minimize the total of predicted delaying and backlogging costs by determining the ordering duration for each element (Fekpe & Fiagbey, 2021). To investigate the interactive impacts of market dynamics uncertainty, a flexible MRP automated production system model was formulated (Salmon & Thompson, 2021). On numerous system performance indicators, including shipping delays, quantity of installations, ending stock levels, item shortfalls, and amount of exception filings, these risks were represented in terms of improvement in batch size, scheduling, anticipated purchases, and regulation barriers. The mathematical programming method for planning MRP systems with constraints. It uses the concept of finished product compression to minimize the number of variables and consequently the size of the issue (Coffie et al., 2022; Donkor, Papadopoulos & Spiegler, 2021).

MRP aids in the coordination of manufacturing, engineering, buying, marketing, and human resource operations in order to achieve a particular strategy or marketing plan throughout the supply chain (Oo et al., 2021). It also assists supply chain managers in analyzing the consequences of actions; activities can be easily considered into the structure as they occur, such as schedule changes and cooperation of manufacturing with buying, sales, and human capital in such areas as supply delivery timing, utilizing demand forecast to ascertain budget plan, and employee staffing or run-down making preparations (Mdoda & Mdiya, 2022).

2.2.4 Logistics Performance.

Logistics is viewed as a component of a network that delivers a package of benefits from suppliers to end users. Performance measuring is seen as a critical management activity for achieving goals (Mallet, Kwateng & Nuerthey, 2022). Logistics performance is presumed to assess how well the

supply chain is presently supplying value proposition to customers and strengthen it. Effectiveness, efficiency, and flexibility are the three factors by which logistics success is evaluated (Balenmilen, 2021). Efficiency is an economic benefit, but effectiveness is a customer response benefit. Just-in-time manufacturing and logistic supplier networks are used to boost efficiency. Customer orientation, on the other hand, leads to effectiveness (Amoako et al., 2021). The basic goal of effective logistics is to facilitate the movement of products and services in order to reduce inventory. Well within supply chain, the effectiveness of suppliers and manufacturers is also significantly boosted (Adegoke et al., 2021).

Efforts to improve in business operations and internal operational efficiency of supply chain firms are required for effective logistics management (Dolumbia et al., 2021). High order fill levels that are reliable, considerable and on time delivery percentages, and a low frequency of customer product returns are all requirements for providing the best possible customer service. Organizations should get an achieve the highest efficiency on their assets when it relates to the operational performance of their supply chains. Also, they have to seek for methods to cut their sales and service expenses. (Kulkarni & Halder, 2020). The worth of a logistics is enhanced by efficiency and effectiveness. Value is defined as a collection of active and passive connection functions that produces financial and non-financial outcomes. Logistics effectiveness has an indirect impact on value, but logistics efficiency has a direct impact (Hofmann et al., 2019).

2.2.5 Customer satisfaction

The client is someone who the company is willing to influence by the ideals it creates. Customer happiness is a significant problem that is linked to global competition (Nawi et al., 2018). Customer pleasure, according to Edward Deming (2021), is linked to quality. As a result, this may

be used as a measure of customer satisfaction efficacy. Customer is an individual for whom a corporation is willing to have an impact on their behavior in order to produce value (Tarofder et al., 2019). After using a good or service, customer satisfaction is described as the consumer's sentiments or behavior toward it (Yalcin, Shi & Rahman, 2020). Repeat purchases, the acquisition of new items, and the acquisition of products by consumers who have been inspired by pleased customers all contribute to a growth in revenue and profits (Maluleke et al., 2021). Clients that are very satisfied with a company share their great experiences with others, and as a consequence, they advertise for the company, lowering the cost of attracting customers (Baba et al., 2021).

Customer happiness has emerged as a critical component in firms' efforts to foster recurring relationships with stakeholders and boost long-term revenue (Qazi et al., 2021). The overwhelming preponderance of companies are in competition, and they need to provide high-quality services that delight and keep customers in order to thrive. Additionally, it is important for logistics companies to comprehend their target market because doing so will increase their ability to make informed decisions about their customers' needs. This will also enable them to expand their product offerings to include genuine benefits for their customers and to quantify the fundamental values that they hold dear (Nyarko & Kozári, 2021). A customer-centric approach better matches the customer's demands. Customer-oriented organisations use business knowledge / analysis to build innovative services and fully comprehend how customers evaluate them; they are more customer-focused than their rivals, believing that their organisations operate solely to satisfy their clients and that their needs should always come first (Okoampa-Larbi et al., 2021). It's important to keep in mind that every consumer has (or might have) different expectations. This might be impacted not just by individual preferences but also by the environment, location, and kind of business where such prejudices are formed (Seth & Xiaofang, 2021). As a consequence, businesses' capacity for

fast learning and adaptability may provide them an advantage over rival companies. Flexibility is crucial as it pertains to logistics services. The capacity of a company to quickly and effectively respond to a customer's changes in the marketplace is known as adaptability in the logistics industry (Owusu-Sekyere & Darkeh, 2022).

Customer satisfaction refers to the quantity, quality, and loyalty of a company's market share. Customer happiness results in brand loyalty and repeat purchases, and database performance and customer cooperation are two of the many methods a business may use to serve its consumers (Liu et al., 2021). Customer satisfaction relates to the quality of goods, services, price-to-performance proportions, and when a firm fulfills or surpasses the customer's expectations. Client satisfaction may be measured in terms of on-time supply as well as client requirements. Overall inventory management is aided by customer demands, having products on hand and promptly accessible to satisfy those requirements, vendor relationships, which include sharing knowledge regarding sales, sales projections, stock levels, and data integrity (Appiah, 2021; Attuquayefio, 2022).

The fulfilling reaction of the customer is satisfaction (Hailegebreal et al., 2022). A product or service's feature, or the products and services themselves, are determined to have provided or are providing a pleasant level of usage pleasure, comprising degrees of possible loss or enjoyment (Jimoh et al., 2022). Offering a high featured product is seldom enough to achieve a high degree of client satisfaction. Researchers have shown that a firm that continually delights its consumers has improved customer loyalty and revenue as a result of increased customer satisfaction (Perez-Ramos et al., 2021). As a result, every firm tries tirelessly every day to capture the minds of consumers through brands, increasing sales and profit. Customers will always pick a brand when they have a positive opinion of it, since consumers create their choices based on the opinions and attitudes toward other brands. Customers will always pick a product or service that provides them

with the greatest level of satisfaction (Dele-Ajayi, Fasae & Okoli, 2021; Salmon & Thompson, 2021).

Customer happiness is the central objective of today's businesses, and its investigators are always doing study on consumers, particularly in relation to their satisfaction (Tarofder et al., 2019). Furthermore, since the customer is the most unexpected stakeholder in the corporate environment, and because pleasure changes and fluctuates across people, there is a need for ongoing study in this field (Yalcin, Shi & Rahman, 2020). Customer happiness is determined by a variety of criteria, including pricing and product quality, in addition to service quality. In an increasingly competitive climate, businesses must adapt to changing client requirements (Wieland, 2021). Customer happiness, according to the author, is one of a company's key indicators of profitability. Businesses nowadays are primarily concerned with satisfying their customers, which has an influence on their competitiveness. Customers' expectations are primarily determined by the supply chain partners' flexibility (Nawi et al., 2018).

2.2.5.1 Cost minimization

In the corporate world, SCM and LM are critical (Nawi et al., 2018). The supply chain requires extensive collaboration and coordination both inside and between enterprises. The researchers also suggested a conceptual framework that may be used to guide supply chain decision-making. Various firms are always attempting to reduce their delivery and warehousing costs (Wieland, 2021). To reconfigure a logistic network, tangible computing was created. The approach assists managers in taking into account many factors. A detailed investigation was conducted to examine the latest industry developments distribution strategy (Hofmann et al., 2019). Earlier studies, optimization algorithms, further computational challenges, and case analysis and implementations

were the four aspects of the study (Kulkarni, A., & Halder, 2020). The issue was solved using integer linear programming. Logistics chain simulation is critical for boosting the performance of the complete logistics chain (Doumbia et al., 2021). The OR model is also critical for analyzing the performance of logistic sub-chains and operations on a local level. The logistics system in every company is examined on three major levels: the overall organisational chain of supply connection, logistics concepts, and qualities of these principles (Emmanuel, Dauda & Kemevor, 2021).

The logistics strategies were evaluated using an analytic network approach and a structured analytical model (Mallet, Kwateng & Nuerthey, 2022). The supply chain's efficiency, planning, and assessment have become more important. The focus was on reviewing the literature and modeling in multi-stage supply chains (Agyei, Koomson & Akrasi, 2021). The research was conducted as a result of increased production costs, diminishing resources, decreased product life cycles, and other factors (Coffie et al., 2022). In catastrophic logistics management, the mathematical model Path determination was employed. The model's goal was to reduce the overall time spent traveling along a route. It's challenging to choose the right supply chain performance indicator. In every supply chain performance assessment system, performance measurements are recognized as required components (Ansah & Akipelu, 2021).

2.2.5.2 Gross profit margin

According to empirical research, longevity is significantly related to financial performance satisfaction indicators (Agyei, Koomson & Akrasi, 2021). According to earlier studies, a company's ability to make a profit is strongly linked to the competitiveness and desirability of the industrial facility (Maluleke et al., 2021). International businesses, rentals generated by intellectual assets established at domestically and then utilized worldwide, may boost a profitability of the

company. Standard finance information is valuable to both specialists and shareholders in evaluating a company's growth and analyzing its position over a period of time (Ansah & Akipelu, 2021). Rate of return and other accounting ratios were widely acknowledged as indications of success in western corporations by most specialists. According to experts, ROA is a metric that assesses how efficiently a firm creates its product and may be used to compare efficiencies and real business effectiveness (Baba et al., 2021). Bonuses, inner strength, and the ability to retain excellent employees are all aspects that have an influence on revenue growth, as are the associated potential for investments in industrial facilities technology and systems. Additionally, sales expansion helps the learning curve and prospects for cost savings (Nazir, Vervoort & Reddy, 2021).

The majority of market share research looks on whether fundamental market characteristics like cost savings and market share provide purposeful comparative benefit (Appah et al., 2022). Other research looks at the link between market share expansion and revenue. Control for unobserved variables statistically, and the predicted association between sales and profits is dramatically reduced. Sales growth tends to make better use of capacity, spreading fixed costs across greater revenue and resulting in increased profitability. Companies in low-technological-opportunity sectors have more inventive activity than those in high-technological-opportunity ones (Fianko et al., 2021).

2.1 Theoretical Framework

2.1.1 Technology acceptance model (TAM)

Computer systems cannot enhance performance of the organization if they are not utilised, according to Davis et al. (1989). Regrettably, managers' and professionals' opposition to end-user

technology is a common issue. We need to comprehend why individuals decide to like or dislike computers better in order to better forecast, explain, and boost user acceptance.

TAM was introduced by Davis (1989), who described a TAM conceptual background based on "...the influence of system attributes on consumer adoption of computer-based information management". The dissemination of technological and informational advances serves as the theoretical cornerstone of TAM. This hypothesis clarified the rationale behind why people embraced cutting-edge information and communication tools like the Internet, e-mail, and mobile phones. According to Hubona & Geitz (1997), TAM is a gauge of attitudes and beliefs that may forecast future behaviour. The link between two perceptual variables—perceived usefulness (PU) and perceived ease of use (PEU)—is taken into account in order to evaluate the evolution of TAM (PEOU). TAM is "used to offer a platform for tracing the influence of external variables on internal beliefs, attitudes and intention," according to Legris, Ingham & Collerette (2002). They also contend that perceived utility and simplicity of use are crucial aspects of system usage.

Davis et al. (1989) stated that the purpose of TAM was "... to give an insight into the effect of computer adoption that is generic, and capable of clarifying user behaviour across a wide variety of end-user computing technology and user demographic, and at the exact same time being both inexpensive and theoretically supported."

A prospective user's subjective likelihood that adopting a certain application system would improve his or her work performance in a specific setting is how Davis defines perceived utility in the development of TAM (Davis, F.D. 1989). It is possible to define PU as the individual's conviction that employing a system or piece of technology would improve work output. According to Davis (1989), perceived ease of use (PEOU) is "the extent to which the prospective user believes the desired system to be free of effort". It is possible to infer that PEOU refers to a set of ideas

about how that technology or system should be used when it requires no mental effort. Thus, the company utilizes both of these methods to better understand technological acceptances and to forecast users' adoption patterns for computer systems.

The Theory of Reasoned Action (TRA), created by Fishbein and Ajzen, served as the foundation for the adoption of the technology acceptance model paradigm (1975). As seen in Figure 1, Davis said that TRA's goal was to investigate people's beliefs, influences, attitudes, and behaviours, while technology acceptance model used perceived use and perceived ease of use to investigate people's intentions to use and real use action. In technology acceptance model, behavioral intention is mostly dependent on perceived use and attitudes about utilizing the system, whereas actual system usage is directly tied to behavioral intention. Regard for the system is influenced by perceived use and perceived ease of use. Davis was also concerned about the external factors affecting perceived use and perceived ease of use included people's capacities, environmental limits, the sorts of Technology, and more.

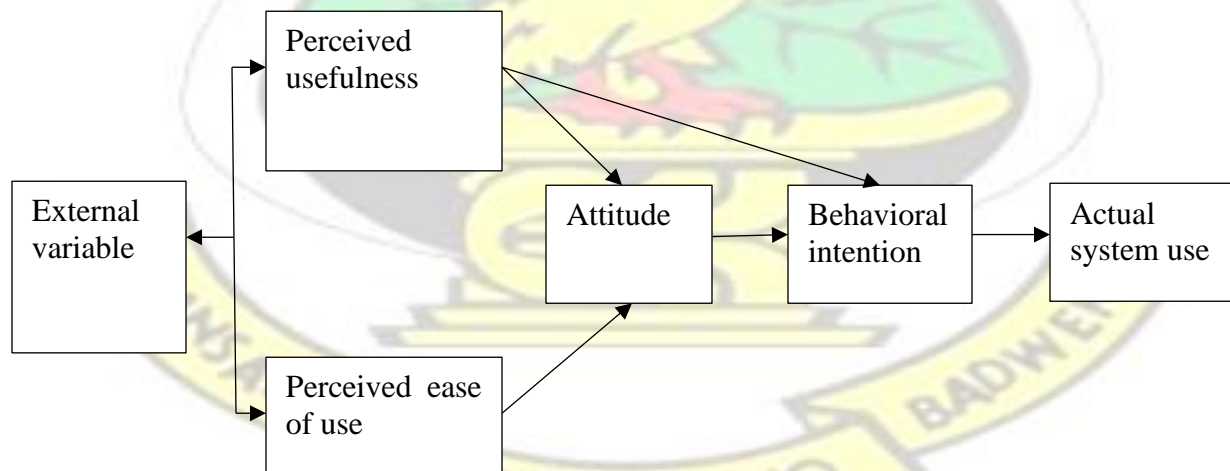


Figure 1 The TAM model is proposed by Davis

Yet, several research have looked at perceived ease of use and contend that it both directly affects perceived use as well as real system use (Lockett, Thompson and Morgenstern, 2009). Additionally, specific research in the fields of information systems and IT has developed a number of external factors. Moreover, research suggests that organisational structure, user characteristics, system compatibility, cultural adaptations, and user characteristics, as well as political and social pressures, may have an effect on the technology adoption model.

2.1.2 Resource base-view model

We might argue that the RBV takes a more introspective approach to understanding why companies succeed or fail by analyzing businesses from the capital side as opposed to the product side (Wernerfelt, 1984). The theory uses the firm's resources as the unit of study in an effort to explain how long a company may be able to maintain a competitive edge (Lockett, Thompson and Morgenstern, 2009).

According to the RBV theory, "companies are profit-maximizing organizations led by constrained rationality managers functioning in different markets that are reasonably predictable and tending towards equilibrium" (Bromiley & Papenhausen, 2003). The RBV theory also acknowledges that knowledge of a resource's potential value is asymmetrically distributed. Ex-ante resources of long-term competitive advantage are made available to a business if its management are fortunate enough to outperform their rivals in predicting the future value of a resource (Kraaijenbrink, Spencer and Groen, 2009). Last but not least, the creation and use of isolation techniques that prevent rival businesses from stealing customers or better resources provide the company access to ex-post sources of long-term competitive advantage (Mahoney, 1995).

The RBV is based on two key premises. In order for heterogeneity to persist, resources are dispersed differently between organisations, and they also cannot be freely moved from one company to another. The RBV's premises are these presumptions. From these presumptions, two fundamental arguments may be made.

First, having access to precious and uncommon resources might provide you an edge over rivals. In order for an organisation to take advantage of opportunities and counter dangers in its environment, it is essential that it has valuable resources. Rare resources are scarce and their distribution throughout the firm's present and prospective competitors is not balanced. Secondly, when certain resources are both non-replaceable and non-imitable, they may serve as sources of long-lasting competitive advantages (Barney, 1991). The extent to which resources are challenging for other businesses to replicate is referred to be imitable. According to Dierickx and Cool (Barney, 1991), social complexity may be the cause of this. There may also be other factors like causation uncertainty and unique historical external factors that influence the resource extraction or acquisition. In order to think of and carry out the same tactics as effectively or efficiently as the initial resource, it is implied that one resource cannot be readily substituted by another one. This is known as non-substitutability of resources. These resources are referred to as Inimitable resources because they are valuable, uncommon, unique, and non-replaceable. They are also more likely to form the foundations of long-term competitive advantage (Barney, 1991).

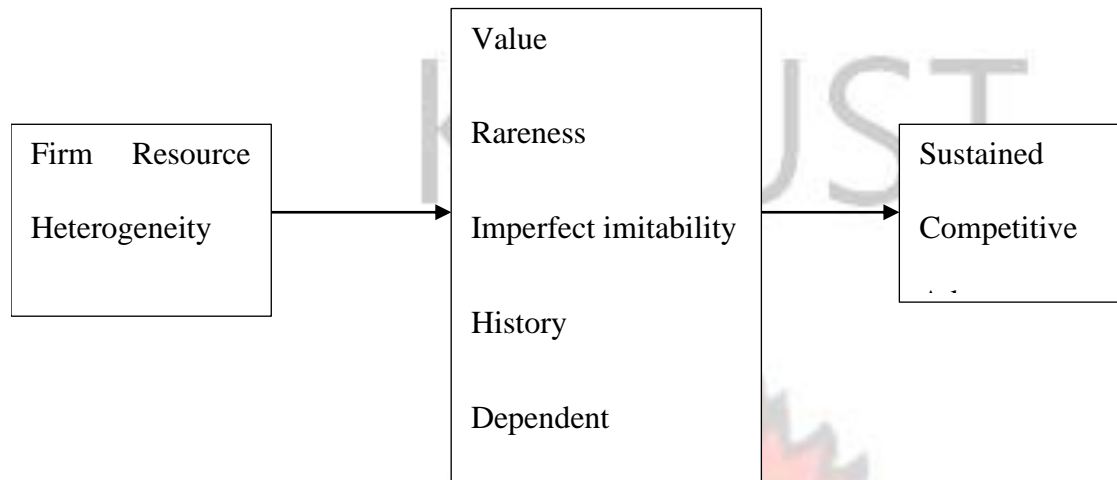


Figure 2: The relationships between firm resources characteristics and sustained competitive advantage

Source: Barney, 1991.

2.3 Empirical Review

Numerous researches look on Information technology and supply chains in certain localities. Yaw (2020) conducted a study Ghanaian leader to evaluate the implications of Supply chain and (ERP) on business competitiveness in Tunisia. Their findings highlight the need of implementing Supply chain and ERP in Tunisian businesses, as well as their favorable implications on corporate competitiveness. They come to the conclusion that information and communication technology has a favorable impact on supply chain performance across geographies.

Wang (2021) looks at the occurrences of ethnic diversity, individual creativity in information sharing, and computer-related self-efficacy within the context of the technology acceptance model (TAM) for Enterprise resource planning deployment in manufacturing enterprises in China. The results, which are based on an internet questionnaire completed by a worldwide user community

using an ERP system developed by one of the biggest IT software vendors in the country, show that crony capitalism has a positive impact on helpfulness while civilization in the measure of power distance has a negative impact.

Elango (2018) examines the impact of the use of IT on the supply chain in the small-scale food business using a qualitative research design technique. Both primary and secondary data collection techniques are used to obtain new qualitative research data from 10 persons and current data/information from secondary sources. The study's findings demonstrate how the use of IT is having an increasing influence on South Singapore's small-scale grocery industry, especially in the supply chain management sector. Food store businesses are working to increase supply chain efficiency and reduce supply operations waste in order to benefit from a variety of ICT-related advantages.

Appah et al. (2021) examines the impact of ICT tools on supply chain performance in Cambodia using a survey questionnaire and discovers that supply chain efficiency would be significantly enhanced if supply chain members collaborated using Internet technologies. Despite this, supply chains are significantly being impacted by the usage of ICT. For manufacturers and retailers, information management has surpassed actual product transportation in importance.

Boteng et al. (2020) created a (RBV) paradigm to evaluate information technology supported assets on both the public end and back end. The RBV was based on the importance of information technology in technology driven supply networks. RBV is attributed by Commey (2021) to improvements in the performance of companies due to valued assets. Information technology wealth generation was examined via one lens, with information technology wealth generation playing a direct impact in business performance. The significant cause is that information technology has an impact on other elements that contribute to a comparative advantage.

Information technology is considered as an independent variable, whereas other factors such as income creation and cost savings are considered as response variable from another perspective. The two key elements of process performance gains via supply chain collaboration are income and cost savings.

The significance of information and communication technology tools on supply chain performance is investigated by Apiyo and Kiarie (2018). The results of a statistical questionnaire form demonstrate that information and communication technology programs are able supply chain processes, advance planning, and control strategic decisions by providing a holistic view of stock, mass transit, facility, and use design for recycling and reuse, as well as limiting resource wastage. They come to the conclusion that information and communication technology instruments help supply chain activities run smoothly.

Boahen (2020) investigates the influence of information technology on the functioning of the Indian supply chain. The case study will focus on a motorbike manufacturing factory in northern India. The data was gathered via a questionnaire. The researcher concluded that study on the use of information technology in Supply chain should be supplemented by study on other supply chain cooperation methods in order to fully comprehend the complex phenomena of Supply chain

The influence of information technology on Supply chain and productivity is investigated by Lissa et al (2021). The paper empirically explores how organizations adopt alternative information technology strategies with supply chain stakeholders to promote buyer and seller resilience, and evaluates the productivity consequences of these two aspects of supply chain resilience, using data gathered from manufacturers in China. Furthermore, the research looks at how information technology ambidexterity tries to deal the conflict between information technology commercialization and information technology discovery in order to improve sustainable supply

chain. The findings suggest that supplier and customer resiliency may both help SC performance. Only exploratory usage of information technology with companies and distributors has major influence on the two dimensions of supply chain resilience. The findings also suggest that the customer's ambidextrous usage of information technology has an impact.

2.4 Conceptual Framework

Technology has historically been a driver for change and innovation in several industries and countries. Businesses and the businesses that employ them are benefiting from the many advantages it offers. According to (Sanjeev, James, & Mona, 2019), businesses that are creative are more likely to succeed and develop. The amount of investment made in ICT-related infrastructure also affects the growth rate realised. The United States, the Netherlands, Canada, and Australia had the highest increases in GDP and labour productivity among the nations that boosted their investment in ICT infrastructures, according to statistics from the Organization for Economic Co-operation and Development (OCED, 2004).

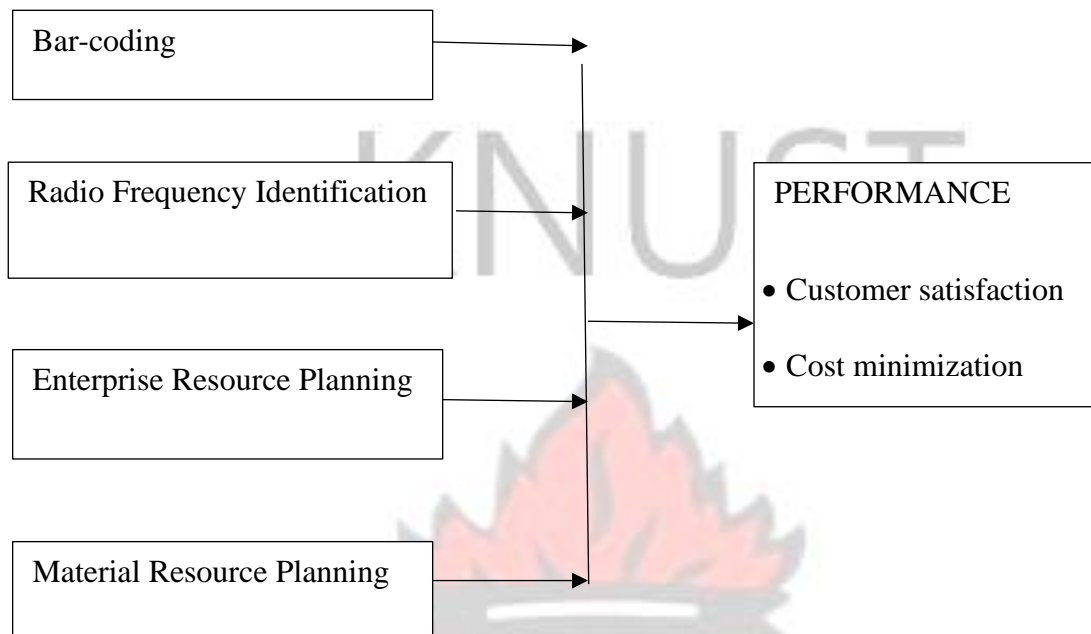


Figure 1: Conceptual framework

Source: Adopted from: Apiyo and Kiarie, 2018.

Increasing performance, whether it be financially or otherwise, is a goal shared by all businesses. To determine how ICT affects logistics performance, several scholars have studied the issue. Depending on how they were tested and analysed, some studies do concur that there is a beneficial association between ICT and performance, while others do not. There is strong evidence that ICT investments foster creativity, and innovative businesses are more likely to prosper. In one research, information technology spending had a favourable effect on productivity but no effect on profitability (Brynjolfsson & Hitt, 2016). Another research discovered that although information technology labour favourably impacted profitability and production, information technology capital had no beneficial impact on productivity (Prasad & Harker, 2017). Although the Single Automated System model was deployed in 2016 to increase operational efficiency, Ghana's Logistic Performance Index saw a dip from an index of 2.66 in 2016 to 2.57 in 2018. These

uncertainties are what prompted the researcher to conduct study and determine how ICT affects the performance of the logistics companies in Kumasi, Ghana.

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CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter explains the study's methodology and techniques. The study's "design, target population, sampling strategy, data collection techniques, data source, data collection instruments, data analysis, validity and reliability problems, ethics," and statistical tools used to examine the summary results are all discussed.

3.1 Research Approach

To examine the impact of Information and Communication Technology practices on the performance of logistics management at logistics enterprises in Kumasi, the research style would be quantitative. According to Faria (2019), if the goal of the inquiry is to define the degree of correlation between the variables, a quantitative survey is the best strategy. It also helps with the analysis and description of the connections between the variables. As a consequence, workers from a limited group of Logistic firm personnel were chosen as the statistical population. The fact that this study tried to answer issues about the impact of information and communication technology practices on logistics management performance in Kumasi logistics enterprises.

3.2 Research Design

The aim of the inquiry, as well as the strategies for acquiring information, analyzing it, and reporting the findings, are all described in the research design (Khan et al., 2020). To accomplish its objectives, the study employed cross-sectional descriptive and explanatory research designs. To grasp and appropriately examine the influence of Information and Communication Technology

practices on the performance of logistics management at logistics enterprises in Kumasi, a descriptive research design was used to define the data and features of the samples. The study's descriptive research approach enables it to collect data using survey methodologies.

Explanatory design, according to the researcher, is the best research strategy for addressing the primary and secondary research topics. Explanatory design is the ideal method to utilise in order to test a hypothesis or explanation, therefore choosing it is suitable (Ali, Hussin & Abed 2020). This style is also very helpful for analysing correlations and trends in quantitative data while also being able to provide an explanation for the mechanisms or causes of the resulting trends (Monette et al., 2011). Variations in the perception of the research output are one of the criticisms of the concentration-profitability link. For instance, there seems to be an ongoing argument between researchers who study market power and efficiency. According to the efficient market hypothesis, greater market shares and higher levels of concentration are caused by improved efficiency and lower costs instead of a lack of competition (Burns and Grove, 2001). Yet, despite disagreements over how to interpret the findings, earlier scholarship has made a significant effort to quantify the association. Consequently, based on existing information, it is possible that the researcher may use a quantitative technique by examining the link between logistical performance and ICT to address the primary study issue.

3.3 Target Population

The study population for the study was made up of the 1000 employees in all five selected branches of Logistic companies in Kumasi, Ghana. The companies were selected at random.

3.4 Sample Technique and Sample Size

The study drew study respondents from the target demographic using random probability sampling approaches including convenience sampling. Employees of the logistic firms were chosen using simple random technique since employees will be willing and conveniently available to offer pertinent information as requested by the study. Congruent with the recommendations of Khan et al. (2020), For many quantitative investigations, the study's sample size was 500 personnel from the Logistic firm, this will make it possible to pass the 5percent confidence level.

3.5 Data Collection Method and Procedure

The research approach considers the procedure which details the method for data collection and analysis. In this study, the research uses a cross-sectional survey approach in the distribution of questionnaires to respondents. The intent of using the survey approach was to allow the researcher make an interpretation from the sample and hypothesize it to the general population. The questionnaire distribution and collection will be done over a period of one and a half month. The researcher uses SPSS version 16 to conduct a regression analysis of the data. This involved the use of basic descriptive such as frequencies, percentages, mean and standard deviation. Descriptive analysis describes the basic attributes of the data in a study by providing basic summaries about the sample and the related measures. Descriptive analysis and other simple graphics analysis are integrated in virtually all quantitative analysis of data.

Primary data was obtained from respondents at each of the five selected assemblies in order to have a deeper grasp of the issue under investigation. Respondents will be presumed to have direct knowledge of the subject under investigation. A self-administered survey questionnaire will be used to ascertain informational data from the partakers. Before commencing real data gathering,

the researcher has informed the management team and other pertinent personnel about the research's goal.

The current study explored the impact of incentive on employee performance at Logistic companies in Kumasi. The predictor variable explored in the study was information and communication technology while the criterion variable entails logistic performance.

3.6 The Research Instrument

According to Ali, Hussin & Abed (2020), the skeleton of each research study is correctly constructed questions. The major primary data gathering instrument was in a structured (closed-ended) questionnaire used to solicit information from the study participants. The study uses primary data, this is the most appropriate and available form of data for the study. Zikmund et al., (2010) defines data as records or fact that examine a particular phenomenon. According to Burns and Grove, (2001) a practice of systematically choosing respondents and collecting information is known as data collection. A questionnaire is a data collection instrument that has pre-recorded questions that allows specific respondent responds to with or without the help of the researcher (Monette et al., 2011). The study employs close ended questionnaires for this study. The questionnaire is divided into four sections. Section I was used to collect general information on the participants. Sections II – IV each measured the four variables of this study and participants' responses measured using a Likert scale.

Table: Construct of variables

Construct	Sub-construct	No. of Items	Source
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ICT	Bar-coding	5	Lalitha et al., 2017
	RFI	5	Ali & Haseeb, 2019
	ERP	5	Samiei & Habibi, 2020
	MRP	8	Anguelov, 2021
Logistics	Customer Satisfaction	2	Nawi et al., 2018
Performance	Cost Minimization	2	Ansah & Akipelu, 2021
	Gross Profit Margin	2	Appah et al., 2022

Source: Authors Own Construct

3.7 Validity and Reliability Test

The term "test for validity" relates to how correctly data reflects what it is designed to depict. It shows that the instrument does indeed measure what it purports to measure. As a result, several academic studies are employed to assess the impact of incentive programs. All survey questions are built using a five-point Likert scale, with the exception of the demographic items and an extra comment related to the study. The utmost effort was taken to make a logical connection between the questionnaire items and the study's purpose.

The study had direct interaction with assembly staff to gather primary data, as well as the chance to analyze all relevant sources of information to ensure that the information acquired was accurate.

3.7.1 Reliability Test

A reliability test was performed to establish the research's level of dependability. The dependability of a measure determines how devoid of bias it is and how consistently it measures throughout time (Khan et al., 2020). Cronbach's alpha is a correlation coefficient that indicates

how well two things are linked. The more the Cronbach's alpha is to 1, the stronger the internal consistency dependability (Ali et al., 2020).

3.8 Method of Data Analysis

The data will be reviewed in line with the study's introductory chapter's research objectives/questions. The conclusions of the study were based on descriptive and inferential statistics. Descriptive statistics, such as frequency distribution, were used to examine the demographic data of respondents. ICT and logistic performance were also measured using mean scores and standard deviation. Inferential statistics like correlation and regression analysis, on the other hand, were used to investigate the influence of ICT on logistics performance. The data analysis tools were IBM's SPSS Version 26.

3.9 Ethical Consideration

Research work, like many subject areas, is surrounded by ethical issues and it is important that researchers develop an approach to address these issues. Since research involves collecting data and views about people and institutions, researchers need to protect their participants, develop trust, guard against misconduct and impropriety, and preserve the integrity of the research (Israel & Hay, 2006). Creswell (1998), suggests that ethical issues apply in the different types of research and to every stage of the work. To achieve the above listed objectives, the researcher in this current study seeks the approval of the above listed institutions, participants, and other indirectly related institutions. Also, under no pressure will a participant partake in the study. Researcher assures the participants of the confidentiality of any information and non-disclosure on identity at will. Again,

the researcher has to the greatest extent acknowledges the contribution of previous authors whose works have been referenced in this current study.

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CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Introduction

The goal of this research was to look at the influence of ICT practices in Kumasi logistics firms. Based on the study's goals, this chapter presents data analysis, findings, and discussion of the findings. This study relied on primary data acquired via questionnaires from workers of logistics firms in the Kumasi metropolitan, Ghana.

4.1 Background Information of Respondents

Respondents were asked to declare their current job status. The goal was to determine the amount of ICT use. Over half of the respondents (54.6percent) worked in middle management, 43.4percent in junior management, and 6percent in senior management. 91.4 percent of respondents were full time workers, while 8.6 percent worked on a contract basis.

Table 4.1: Distribution of demographic statistics

Distribution	Frequency	percent
Level of Employment		
Junior	56	43.4
Middle	70	54.6
Top	3	2.0
Total	129	100.0

Nature of Employment

Full-time	118	91.4
Contract	11	8.6

Total	129	100.0
Work Experience		
0-4 years	58	45.1
5-9 years	39	30.5
10-14 years	16	12.2
20-24 years	14	11.2
Not indicated	2	1.0
Total	129	100.0
Level of Education		
Certificate	18	13.5
Diploma	26	20.4
First degree	49	38.2
Post graduate degree	36	28.0
Total	129	100.0
Gender		
Male	66	51.3
Female	47	36.2
Not indicated	16	12.5
Total	129	100
Age		
18-25	8	6.3
26-33	57	44.7
34-41	45	34.5
42-49	19	14.5
Total	129	100.0

Source: Analysis of field data, December 2021

In order to determine performance based on longevity, respondents were questioned about their duration of service in their respective firms. According to Table 4.1, the proportion of participants (45.1percent) had operated for four years, thirty percent for nine years, twelve percent for fourteen years, and eleven percent for twenty-four years. This might indicate that the employee is departing early because of poor performance or unstable patronage. This simply indicates that a large number of people have extensive job experience, which will help the institution run more smoothly. Table 4.1 also revealed that 20.4 percent of the respondents had received a Diploma, while 13.5 percent had received a Certificate. 38.2 percent had a bachelor's degree and 28 percent had a master's degree.

The purpose of the research was to determine the gender makeup of the respondents in order to determine whether gender was more involved in ICT activity than the other. Despite the fact that the study did not concentrate on gender equality, the frequency indicated that the sample was skewed toward men. Table 4.1 shows that the majority of respondents (51.3percent) were male and 36.2percent) were female, while 12.5 percent did not specify their gender. The bulk of the respondents, 44.7 percent, were between the ages of 26 and 33, as seen in Table 4.1. 34.5 percent were between the ages of 34 and 41, and 14.5 percent were between the ages of 42 and 49. Only 6.3 percent of the participants were between the ages of 18 and 25. The findings suggest that the organization has a mix of enthusiasm and experience.

4.2 Barcode as ICT Practice

One of the study's goals was to determine the volume and scope of barcode adoption in logistics enterprises in Kumasi, Ghana. Table 4.2 summarizes the findings.

Table 4.2 Barcode as ICT Practice Survey

Statement	5	4	3	2	1
Barcode improves tracking and inventory management	13.2	17.7	1.3	35.0	30.9
With barcode scanning, redundant information and error corrections can be made in real-time.	31.1	33.3	7.2	18.6	11.9
Barcode improves transparency to meet regulatory requirements	31.3	32.2	3.4	17.8	15.2
Barcode scanning technology eliminates the costly need to manage labour costs and maintain bottom line.	28.4	34.4	10.1	20.9	6.2
Barcode are as durable as RFID tags	15.0	19.2	4.7	34.4	26.8

Legend: 1 - strongly agree, 2- agree, 3-neither agree nor disagree, 4- disagree, 5- strongly disagree

Source: Analysis of field data, December 2021

Table 4.2 shows that a higher percentage of respondents, 35.0 percent, believed that barcodes assist monitoring and stock control. Furthermore, 30.9 percent fully agreed with the same assertion. This means that manufacturers and retailers may use barcode scanning to speed up the fulfilment process. One barcode may offer rapid access to different types of data, such as how a container ought to be assembled or where it should be transported on the loading dock. Employees and cab drivers may use the same barcode to manage documentation, monitor when and where things happen, and better manage inventory. Nevertheless, 19.4 percent of respondents disagreed.

31.1 percent completely disagreed and 33.3 percent disagreed that duplicate information and incorrect repairs can be done in real-time using barcode scanning inside the businesses. They argue that even if a container is damaged or a tag is removed, alternatives exist to make payment using even inadequate data. This conclusion is clarified by Kumar (2014), who stated that in order to truly comprehend the complex phenomena of SCM, study on the use of information technology in SCM should be supplemented with research on alternative supply chain coordination methods.

31.3 percent completely disagreed and 31.2 percent disagreed with the assertion that barcodes improve transparency to satisfy regulatory standards inside the organization. Respondents did not agree that granular insight into the supply chain provides more transparency in meeting regulatory standards. Many businesses are concerned about this, particularly those in the food sector. Just 17.8percent agreed with the assertion that barcode sensor technology makes monitoring items faster and more practicable. Businesses may utilize this data to handle recalls more rapidly with full depth, by the respondents, perhaps saving lives.

The second item on which respondents were asked to comment was that barcode scanning technology reduces the expensive requirement to monitor labour expenditures and preserve the bottom line. According to the findings, 34.4 percent and 28.4 percent of respondents disagreed and strongly disagreed with the statement, respectively. Finally, 27.9 percent strongly agreed with the assertion that barcodes are as robust as RFIDs tags, while 34.4 percent agreed. They claim that barcode scanning technology removes the high expense of managing labour expenditures. These systems are fully automated and need little to no human intervention. Simultaneously, labour expenses in the sector keep on rising, increasing the cost of human-managed supply chains. Nevertheless, 20.2 percent disagreed with the assertion, with 14 percent strongly disagreeing.

4.3 Radio Frequency Identification (RFID) as ICT Practice

Table 4.3 shows the respondents' degree of agreement or disagreement with the practice of RFID of businesses.



Table 4.3 Radio Frequency Identification (RFID) as ICT Practice

Statement	5	4	3	2	1
RFID makes it easier to implement flexible manufacturing processes	19.4	11.6	6.2	25.6	37.2
RFID increases the accuracy of and reduce the time spent taking inventories	12.5	11.9	9.0	33.9	32.8
RFID improves reliable track and trace in challenging physical environments	10.7	17.0	8.8	25.4	38.1
RFID increases efficiency and cut down on rework	1.6	21.9	9.9	27.2	39.5
RFID improves the quality and transparency of data across the supply chain	13.3	16.9	5.4	28.6	35.7

Legend: 1 - strongly agree, 2- agree, 3-neither agree nor disagree, 4- disagree, 5- strongly disagree

Source: Analysis of field data, December 2021

Radio frequency identification (RFID) got a substantial favorable reaction, with 37.2 percent totally agreeing and 25.6 percent agreeing that radio frequency identification makes it simpler for businesses to employ agile production methods. This indicates that radio frequency identification can also be used to gather and analyze data to a label on an item in instantaneously. Flexibility in the composition and distribution of data to the different production units is required to produce manufacturing operations more adaptable. The capacity to handle and react to an increased flood of continually changing data is required, and respondents suggest that this skill may be used to enable dynamic production a possibility.

Several of the respondents also fully agreed that radio frequency identification improves inventory accuracy and saves time (32.8 percent and 33.9 percent, respectively). They argue that hand tallying inventories is a time-consuming, wasteful, and incorrect procedure. radio frequency identification may be utilized to remove or decrease the requirement for "hand-scanning," leading in quick and substantial inventory monitoring advantages. These outcomes have a direct influence on customer satisfaction and loyalty, as well as improved revenue. This finding supports Bottani and Rizzi's (2008) findings that only exploratory usage of IT with providers and buyers has substantial impact on supply chain resilience.

Furthermore, 38.1 percent and 25.4 percent of the respondents actually agreed that radio frequency identification increases effective monitor and tracing in demanding physical conditions. Excessive moisture, dramatic temperature differences, chemicals and pigment contact, very high heat, harsh treatment, and filth all strike devastation on traditional paper barcode labels, according to the researchers. Radio frequency identification tags with special encapsulation are made to resist and work dependably under even the harshest conditions.

Likewise, the proportion of participants felt that radio frequency identification improves productivity and reduces duplication, with 39.5 percent strongly agreeing and 27.2 percent agreeing. This suggests that radio frequency identification may be especially useful in seamless repetition systems with recyclable methods of transport. Real-time visibility provides for thorough surveillance and analysis of goods and processes, allowing for swift activity and operational modifications that have a significant influence on quality to be implemented in a timely and precise way, possibly saving thousands. This study is in line with Capgemini's (2008) observation that SC performance would be greatly improved if supply chain participants interacted using Internet technologies.

Again, 35.7 percent actually agreed and 28.6 percent agreed that radio frequency identification increases the quality and openness of data throughout the supply chain, meaning that accurate, readily accessible data may alleviate a variety of system failures. Respondents suggested that applying the notion of dispersed data is the best method to design a system with the greatest dependability and accessibility.

4.4 Enterprise Resource Planning (ERP) Systems as ICT Practice

Table 4.4 shows the respondents' degree of agreement or disagreement on how information and communication technology might help with ERP.

Table 4.4 Enterprise Resource Planning (ERP) Systems as ICT Practice

Statement	5	4	3	2	1
ERP enables you to manage your business with one system	10.9	10.0	9.4	44.1	25.7
Newer ERP systems are upgrade-friendly	10.1	14.7	4.7	39.8	30.8
ERP Systems streamline business processes	29.8	35.3	5.1	21.5	8.3
ERP systems help you better analyze your business' data	2.3	14.7	10.1	40.2	32.6
ERP Meeting customer expectations	10.9	20.1	6.2	31.9	30.9

Legend: 1 - strongly agree, 2- agree, 3-neither agree nor disagree, 4- disagree, 5- strongly disagree

Source: Analysis of field data, December 2021

Table 4.4's results on Enterprise Resource Planning (ERP) Systems as ICT Practice revealed that 44.1 percent of respondents agreed and 25.7 percent totally agreed that ERP allows you to manage your organization with one system. This demonstrates that an ERP solution unifies and connects all of these diverse company operations into a single system.

Modern ERP systems are update is available, according to 39.8percent of participants, with 30.8 percent strongly agreeing. ERP systems, they claim, are built to provide development with flexibility, adaptability, and scalability. More significantly, it may help you manage your users, shareholders, and suppliers more effectively.

Providing a response to a query about ERP 35.3 percent disagreed and 29.8 percent totally disagree with systems simplifying corporate operations, whereas 20.2 percent agreed and 9.3 percent totally agreed, indicating that the system boosts work efficiency while lowering effort and staff costs via increased automation. An ERP system may assist you in meeting the needs of your key suppliers and external customers, as well as keeping your staff strong supporter by removing them from dull, repeated activities.

Moreover, the most respondents (40.2 percent) and totally agreed (32.6 percent) that ERP systems aid in the greater analysis of data in your organization. ERP provides actual information on corporate operations, resource availability, and task state. Users can be certain that the data people see is updated and useful, according to respondents, which is not always the case with outdated systems.

Finally, respondents were unanimous. 31.9 percent and 30.9 percent agreed that ERP satisfies consumer expectations, respectively, whereas 20.1 percent disagreed and 10.9 percent totally disagree with this assertion. Those who strongly agreed say that the company must ensure that their functional areas interact with one another in a systematic fashion so that, anywhere at set moment, each division has appropriate customer data in one place and can communicate with a buyer proficiently over any platform.

4.5 Material Resource Planning (MRP) Systems

Table 4.5 shows the amount of agreement or disagreement among respondents on how ICT might help with ERP.

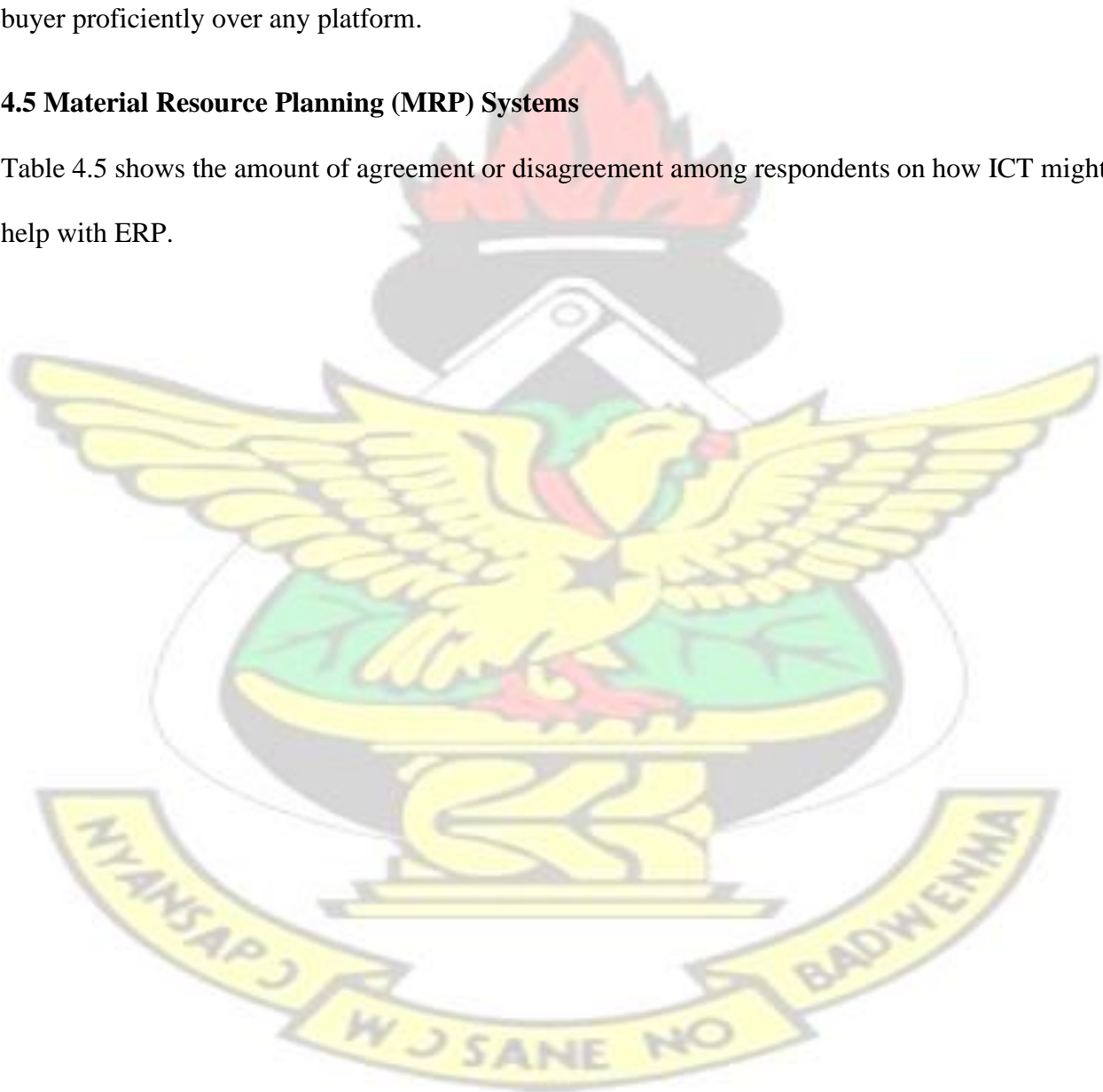


Table 4.5 Material Resource Planning (MRP) Systems Survey

Statement	5	4	3	2	1
Inventory management is crucial to manufacturing efficiency	7.6	9.4	3.1	50.1	29.8
Purchase planning streamlining the production process	11.1	13.2	43.7	32.4	39.7
MRP systems detect bottlenecks in the production line caused by scarcity or a reduction of material	7.0	15.5	6.2	31.0	40.3
Managers' use MRP information to control hourly operations, equipment and labour tasks.	0	14.7	9.3	38.8	37.2
Information from the MRP system tells the manufacturer as whether to hire or buy operational assets.	9.9	14.2	4.7	29.9	41.5

Legend: 1 - strongly agree, 2- agree, 3-neither agree nor disagree, 4- disagree, 5- strongly disagree

Source: Analysis of field data, December 2021

According to the results of the MRPs survey, the most of the participants agreed with all of the claims, indicating that MRP is critical to the operational effectiveness of logistics companies. Stock control is essential to production efficiency, according to 29.8percent and 50.1 percent of respondents. Material Resource Planning systems, according to respondents, use data again from manufacturing timelines to estimate the precise amount and cost of goods needed to satisfy demand. Material Resource Planning systems ensure an optimal stock level of components and materials, lowering overstock and optimizing stock levels throughout the course of a manufacturing operation.

Procurement planning streamlined the manufacturing process, according to 32.4 percent of participants, with 39.7 percent strongly agreeing. They allege that procurement teams set up MRPs to proactively engage vendors when a transaction is required. Apiyo and Kiarie (2018) found that ICT tools assist supply chain processes, advance planning, and management overall strategy by providing a comprehensive view of stock , mass transit , infrastructure , and use layout for recovery and recycling, as well as limiting resource wastage.

Furthermore, MRP systems identify production line inefficiencies induced by paucity or resource shortages. The majority respondents fully agreed (40.3percent) and agreed (31.0percent) to this assertion. They claim that the technology can redirect manufacturing or propose rerouting to a variety of products when supplies are accessible. MRPs may also direct resources to a certain manufacturing phase at the cost of a phase that is short on parts and components. MRPs assist producers in planning their manufacturing lines, although when resource supply is limited.

Organizations perform MRP data to govern daily operations, machinery, and labor duties, according to participants. MRP data is used by supervisors to regulate daily operations, machinery, and labor duties, as well as precisely anticipate human effort and expenses.

Lastly, the material resource planning system informs the company on whether to recruit or acquire functional capital, with 41.5 percent strongly agreeing and 29.9 percent agreeing. "Data from the material resource planning system advises the producer what technology is required, when more labor is necessary, and whether to employ or acquire functional capital," respondents suggested.

4.6 Performance Before the adoption of ICT

The research wanted to show in Table 4.6 how agreed or disagreed respondents were with the company's performance prior to ICT adoption.



Table 4.6 Performance (Before the adoption of ICT) Survey

Statement	5	4	3	2	1
Our company's reputation improved in the eyes of the Customers.	8.7	17.1	16.1	31.7	26.5
Employees' productivity was above the industry average.	10.9	16.1	11.3	31.3	24.5
Relations with suppliers and customers were stable and excellent.	31.2	32.3	15.3	11.7	9.5
Our company's return on assets (ROA, percent) was above the industry average.	29.8	30.7	19.4	12.4	7.8
Sales growth in our company was at a faster rate.	25.7	37.1	19.4	13.0	4.9
Our Company's liquidity ratio was above the industry average.	29.1	35.2	21.2	10.1	4.4

Legend: 1 - strongly agree, 2- agree, 3-neither agree nor disagree, 4- disagree, 5- strongly disagree

Source: Analysis of field data, December 2021

The participants highly agreed 26.5percent and agreed 31.7percent to the assertion that our corporate image increased in the eyes of the clients, according to the findings. 17.1percent disagreed, while 15.1percent were undecided. This research implies that certain organizations engaged in actions that assisted them establish client satisfaction even before they used information and communication technology. Furthermore, 24.5percent fully agreed, and 31.3percent agreed, that staff performance was beyond the industry norm. Nonetheless, 16.1percent disagreed with the notion, which might be due to the fact that some companies engaged their personnel in retraining and other initiatives that helped employees extra efficient even before information and communication technology was adopted. Additionally, 31.2percent of respondents completely disagreed with the assertion that relationships with suppliers and consumers were steady and outstanding, while 32.3percent disagreed. Despite this, 11.7percent agreed and 15.3percent disagreed. Significant job was completed physically prior to the emergence of information and communication technology. Much paperwork was required, and communication means were insufficient, resulting in an unhealthy correlation with suppliers and consumers. Our firm's return on assets (ROA) was beyond the industry average, according to 29.8percent of respondents who disagree strongly and 30.7percent who disagreed. In addition, a large number of respondents strongly opposed 29.1percent and severely disputed 35.2percent that their firms' financial position was beyond the industry average, although 21.2percent were unsure, 9.1percent agreed, and 4.4percent highly agreed. Lastly, a majority of respondents opposed 37.1percent and strongly objected 25.7percent with the premise that our firm's sales volumes was quicker, although 19.4percent were unclear and 14percent disagreed.

4.7 Performance After the adoption of ICT

The study sought to point out in Table 8 below the level of agreement or disagreement of respondents with the performance of the firm after the adoption of ICT.



Table 4.7 Performance (After the adoption of ICT) Survey

Statement	5	4	3	2	1
Our company's reputation improved in the eyes of the Customers.	9.4	7.4	1.0	43.1	39.1
Employees' productivity was above the industry average.	9.3	9.9	4.9	39.9	36.1
Relations with suppliers and customers were stable and excellent.	0	11.1	10.6	39.3	39.0
Our company's return on assets (ROA, percent) was above the industry average.	8.5	11.1	3.7	40.6	36.1
Sales growth in our company was at a faster rate.	2.0	7.3	7.0	49.4	34.4
Our Company's liquidity ratio was above the industry average.	6.2	12.8	5.9	36.1	39.1

Legend: 1 - strongly agree, 2- agree, 3-neither agree nor disagree, 4- disagree, 5- strongly disagree

Source: Analysis of field data, December 2021

After the deployment of I information and communication technology CT by logistics firms in Kumasi, Ghana, according to the study A considerable good reply from the majority of the respondents was identified. The argument that their corporate image has improved in the eyes of the customer had a good reaction, with 39.1 percent strongly agreeing and 43.1 percent agreeing, as did the allegation that staff performance is above the industry norm, which garnered 36.1 percent absolutely agreeing and 39.9 percent agreeing. This suggests that, although participants indicated their agreement with these claims before to information and communication technology adoption, the rate of agreed replies after information and communication technology adoption outnumbers the rate of agreed responses prior to information and communication technology adoption, suggesting that the use of information and communication technology did play a role in this achievement.

Additionally, 39.0 percent absolutely agreed and 39.3percent agreed that relationships with buyers and sellers are dependable and fantastic following information and communication technology implementation. Nowadays, information and communication technology has aided in the supply of technical gadgets that include sellers and buyers into the firms' systems and facilitated communication. In addition, 36.1percent entirely agreed and 40.6percent agreed that their firm's return on assets (ROA) is now greater than the industry average, and 39.1percent absolutely agreed and 36.1percent agreed that their firm's solvency ratio is higher than the industry average. This suggests that information and communication technologies increase not only functional but also economic performance of organisations.

Ultimately, after the use of information and communication technology, 34.4percent absolutely agreed and 49.4percent agreed that overall income within the organisations will be faster. Without

a doubt, the firms have some sales boost prior to information and communication technology adoption, however the following is a benefit..

Table 4.8 Descriptive Statistics of Impact of ICT on the Performance of Logistics Companies

Statement	N	Min	Max	Mean	Std. Dev.
Bar-Coding	129	1.00	5.00	3.8000	1.01419
Radio Frequency Identification	129	1.00	5.00	3.9333	0.96115
Enterprise Resource Planning	129	2.00	5.00	3.7667	0.72375
Material Resource Planning	129	1.00	4.00	4.2000	0.86189
Performance of Companies	129	4.00	5.00	4.5333	0.51640

Scale (mean) 0 – 2.5 = low; 2.51 – 3.5 = Average and 3.51 and above = High

Source: Analysis of field data, December 2021.

The outcome shown in Table 4.8 illustrates that the Information communication technology strategy being employed today is delivering the appropriate effect in terms of corporate performance. This is because most of the qualities have mean values larger than 3.5. For instance, most of the respondents think that the present IT strategy has less problems; they also feel that the distribution plan is enhancing performance of the organisation. Regarding whether the existing distribution method should be continued, the average score of 4.8 suggest that participants agreed that the Material Resource Planning technique should be kept.

According to Kotler and Keller (2018), ICT effect corporate performance. Thornton and White (2011) believe that a multiple-ICT approach may provide improved performance since enterprises may employ several ICT channels to increase distribution. When a firm begins utilising a new channel, it may anticipate better sales growth via this channel than the channel it has historically

depended on, since with this new channel a company typically seeks to tap into a new market segment hence has tremendous growth prospects. Wright (2012) also suggests that a multiple-channel approach may help save expenses. Hence, organisations with a multiple-channel ICT strategy may do better than enterprises with single-channel approach.

4.8 Regression Analysis

The regression analysis was used to do additional research into the influence of ICT on corporate performance. The dependent and independent variables were then analyzed using stepwise and multiple linear regression techniques. A regression analysis with a p-value less than 0.05 (0.05) is statistically significant, but a regression analysis with a p-value larger or higher than 0.05 (> 0.05) is not (Hertz, 2001).

According to the results of the stepwise regression analysis, all of the independent variables met the p-value less than 0.05 criteria and were thus included in each step of the analysis to determine their significance level on the dependent variable, with the exception of security and tracking, which was excluded because it did not meet the criteria and thus was not significant enough to predict the dependent variable.

Table.4.9: Stepwise Regression Analysis Excluded Variables^a

Model	Variable	Beta In	t	Sig.	Partial Correlation	Colliniarity Statistics Tolerant
1	Barcode	.108 ^b	1.090	.278	.097	.269
	Material Resource Planning	.314 ^b	4.225	.000	.352	.425
	Radio Frequency Identification	.117 ^b	1.784	.077	.157	.614
2	Barcode	.205 ^c	2.173	.032	.191	.256
	Radio Frequency Identification	.039 ^c	.592	.555	.053	.554
3	Frequency Identification	.054 ^d	.830	.408	.074	.548

a. Dependent Variable: PERFORMANCE (AFTER ADOPTION OF ICT)

b. Predictors in the Model: (Constant), ERP

c. Predictors in the Model: (Constant), EPR, MPR

d. Predictors in the Model: (Constant), EPR, MPR, BARCODE

Source: Analysis of field data, December 2021

Table.4.10: Multiple Regression Analysis Coefficients^a

	Unstandardised		Standardised			99.0 percent	Confidence
Interval							
	Coefficient		Coefficient			for B	
Variable	B	S.E	Beta	t	Sig.	Lower Limit	Upper Limit
(Constant)	.750	.202		3.716	.000	.222	1.278
Barcode	.184	.082	.213	2.244	.027	-.030	.398
Enterprise Resource Planning	.310	.110	.347	2.822	.006	.023	.598
Material Resource Planning	.331	.078	.331	4.220	.000	.126	.536
Radio Frequency Identification	.046	.056	.054	.830	.408	-.099	.192

a. Dependent Variable: PERFORMANCE (AFTER ADOPTION OF ICT)

According to Table 4.10, the effect of barcode use on performance was ($\beta = .213$, $p = 0.027$). This means that barcode utilization was statistically significant and, if enhanced, can boost performance by 21.3 percent. Furthermore, the use of an enterprise resource planning system was shown to be statistically significant at $\beta = .347$ and $p = 0.006$, implying that servicing consumers using ICT tools has the potential to boost performance by 34.7 percent. It was also discovered that the businesses' material resource planning system had a very significant ($\beta = .331$, $p = 0.000$). The capacity of companies to integrate their systems has a 33.1 percent favorable impact on performance. Finally, the radio frequency identification system achieved a ($\beta = .054$), indicating that a marginal increase in the radio frequency identification system by logistics businesses may boost performance by 5.4 percent, but given the ($p = 0.408$), this is statistically insignificant.

The foregoing findings suggest that the ICT indicators utilized as independent variables in the study, such as barcodes, radio frequency identification, enterprise resource planning, and material resource planning, had a substantial impact on the performance of logistics enterprises in Kumasi, Ghana. This is in line with the results of Mzoughi et al. (2008), who demonstrate the relevance of SCM and ERP system adoption as well as their favorable impacts on organizational performance and competitive advantage in Tunisian firms.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

Summary, findings, recommendations, and proposals for further research comprise the study's final chapter. The summary section gives an overview of the study's scope and emphasis, as well as the main methodologies and results. The conclusion section includes comments on each of the individual goals, including whether they were met and what conclusions were formed. The chapter then moves on to specific suggestions based on the study's results. The suggestions are tailored to a single stakeholder or group of institutions. The fourth and final part discusses the recommended research direction.

A total of 129 workers were chosen from a total population of 1000. The respondents were employees of Kumasi-based logistics firms. The sample size in this research was established using Markin (2006)'s criteria for statistically determining the most suitable sample size from the population. The respondents were chosen using simple random sampling. Following a satisfactory pre-test, the primary data gathering tool was a self-administered questionnaire.

The background data was statistically analyzed using descriptive statistics such as frequencies and percentages. The utilization of barcodes, RFIDs, ERP, and material resource planning, as well as each of the firm logistics performance factors, were studied. Stepwise regression and typical multiple regression methods were used to calculate customer satisfaction, cost reduction, and gross profit margin. The components of ICT practices were employed as independent factors, whereas the aspects of logistics performance were used as response or dependent variables. For data analysis, the research employed Statistical Product and Service Solutions, version 26 (SPSS 26.0).

5.1 Summary of Findings

The study's ultimate goal was to determine the influence of ICT practices on logistics enterprises in Kumasi. The research aimed to accomplish three particular goals. The initial goal was to investigate ICT practices in logistics companies. The second goal was to assess logistics organizations' performance, and the third was to establish the impact of ICT practices on logistics enterprises. Our results mainly back with prior academic research showing ICT aids in improving corporate performance. Our studies revealed a strong link between organizations' adoption of ICT and their performance.

According to the report, barcodes are as robust as RFID tags and help with monitoring and inventory management. Respondents do not believe that duplicate information and incorrect fixes can be provided in real-time using barcode scanning. They also dispute that barcode scanning technology promotes openness to fulfill regulatory standards and that it reduces the expensive need to control labor expenditures and preserve the bottom line.

It was discovered that incorporating ICT into a RFID system helps to enact flexible automation, enhances inventory results and reduce time spent restocking shelves, enhances dependable record and locate in challenging workspaces, multiplies efficiency while reducing revamping, and increases the productivity and clarity of data throughout the supply chain processes.

Companies are prepared to handle their company with a single system that is upgrade-friendly and helps better evaluate business data, hence satisfying client expectations, thanks to the ERP. ERP systems, on the other hand, were not discovered to simplify corporate operations.

Stock control was also shown to be critical to production productivity when the MRP system inside logistics corporations was improved. The inclusion of an MRP system improves purchasing planning, streamlines production, and detects delays in the production floor created by shortages or resource shortages. MRP data is used by supervisors to govern daily activities, machinery, and labor duties. The firm may also use data from the MRP system to decide whether to employ or acquire functional resources.

5.2 Conclusion

ICT technologies help supply chain activities run smoothly. Businesses that do not use ICT tools in their supply chain may face challenges such as increased effort, production time, reactivity, quality consistency, and productivity. All firms, particularly in manufacturing, have realized the value of ICT technologies in improving supply chain performance. Such businesses can now keep consistent and efficient documentation for inventories and raw materials, and their supply and transportation networks are properly managed.

Firms should welcome the use of IT in the supply chain in order to reduce costs and increase revenue. Because consumer expectations are high and may cost the organization huge amounts of money, more emphasis should be placed on the strategy and revenue functions to manage purchasing. In order to fulfill changing demands, the structures in place should make it easier to determine current need as well as forecast potential need in order to avoid stock outs or overruns.

To summarize, three of the four independent ICT variables generated by this study were found to be statistically significant in influencing performance, which is adequate to ensure that ICT does

affect performance, helping to make task quickly, more productive, and reliable, and providing companies that use them with significant advantages over others.

5.3 Recommendation

Based on the findings, the researcher implies that organizations keep driving and promoting ICT use inside enterprises, especially in sectors that have yet to be digitized, since the greater the usage rate, the more it aids in achieving a better degree of optimal operation. Also, management should keep up with quick technological advancements in order to maintain its ICT systems abreast in terms of improvement and prevent system vulnerabilities.

The study also suggests that businesses continue to employ and enhance their ERP and MRP systems in order to provide effective and more convenient service to their clients and so enhance the customer experience.

The present study is confined to the Kumasi metropolitan and the logistics enterprises inside the metropolis, thus future research should repeat the study in other regions and industry sectors.

Ultimately, the researcher suggests that logistics enterprises in Kumasi utilize ICT as component of a "system" or "cluster" of supporting various organizational techniques in order to succeed. These should be mechanisms that ensure fairness, which will strengthen the reputation of the firm.

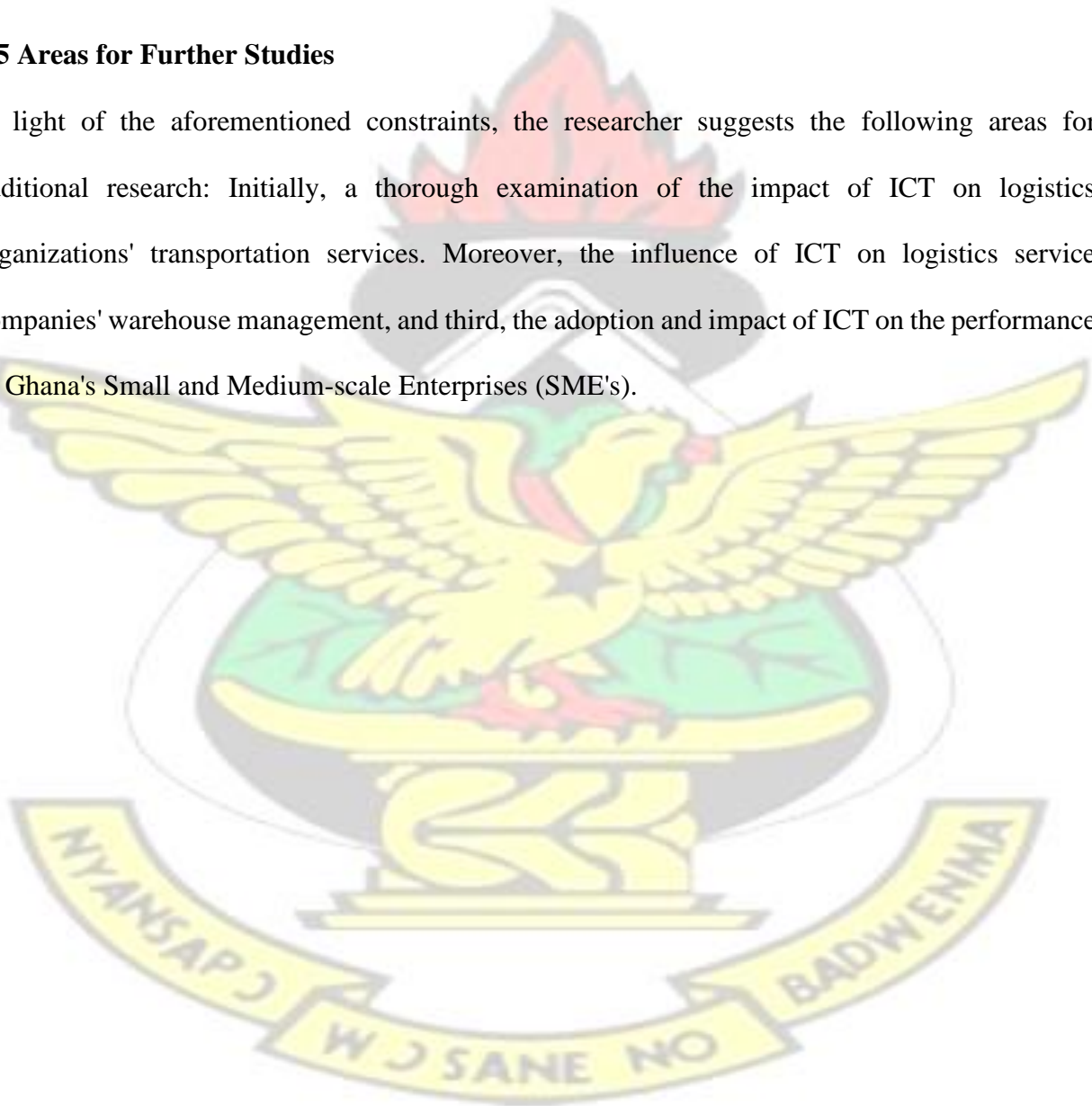
5.4 Limitations of the Study

Realizing that the influence of ICT has always been a subject of research in a variety of disciplines and is currently being investigated, the results of this study demonstrate that ICT has a beneficial influence on the performance of logistics enterprises in Kumasi, Ghana. Although this study was confined to logistics enterprises in Kumasi, Ghana, several firms refused to take part in the survey.

Furthermore, this research only examined four ICT variables: barcodes, radio frequency identification systems, enterprise resource planning systems, and material resource planning systems, although there is a large list of additional variables that may have been employed. Despite the constraints listed above, the study is suitable for academic and industrial use.

5.5 Areas for Further Studies

In light of the aforementioned constraints, the researcher suggests the following areas for additional research: Initially, a thorough examination of the impact of ICT on logistics organizations' transportation services. Moreover, the influence of ICT on logistics service companies' warehouse management, and third, the adoption and impact of ICT on the performance of Ghana's Small and Medium-scale Enterprises (SME's).



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QUESTIONNAIRE

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

IMPACT OF ICT ON THE PERFORMANCE OF THE LOGISTICS COMPANIES IN

KUMASI, GHANA

Respondent,

The purpose of this survey is to obtain information in order to analyze the impact of ICT on the performance of the logistics companies in Kumasi, Ghana. The information obtained from every respondent shall be treated with confidentiality. In view of this, I shall be extremely grateful if you would respond to the following items on the questionnaire. There is no right or wrong answer – your opinion based on your personal experience is what is required. Thank you in advance for your co-operation.

SECTION A: PERSONAL INFORMATION

Please express your views by ticking the box appropriate to your response.

1. Indicate your age
2. What is your gender?
 - a. Male ☐
 - b. Female ☐
3. How long have you been working in your company?
 - a. 0-4 ☐
 - b. 5-9 ☐
 - c. 10-11 ☐
 - d. 20-24 ☐
 - e. Not indicated ☐
4. What is your highest level of education?
 - a. Certificate ☐
 - b. diploma ☐
 - c. 1st degree ☐
 - d. 2nd degree ☐
 - e. other ☐
5. What is your level of employment?
 - a. Junior ☐
 - b. Middle ☐
 - c. top ☐
6. What is the nature of your job
 - a. Full time ☐
 - b. contract ☐

7. State your current position in your company

SECTION B: Barcode as ICT Practice

The following statements concern the the use of barcode in logistics company. Please specify the extent of your satisfaction with each statement by circling from 1 to 5.

Where SA = Strongly Agree, A= Agree, N= Neutral, D= Disagree and SD = Strongly Disagree.

Barcode Survey

Statement	SA	A	N	D	SD
Barcode improves tracking and inventory management					
With barcode scanning, redundant information and error corrections can be made in real-time.					
Barcode improves transparency to meet regulatory requirements					
Barcode scanning technology eliminates the costly need to manage labour costs and maintain bottom line.					
Barcode are as durable as RFID tags					

SECTION C: Radio Frequency Identification (RFID)

The following statements concern the use of Radio Frequency Identification in logistics company.

Please specify the extent of your satisfaction with each statement by circling from 1 to 5.

Radio Frequency Identification (RFID) Survey

Statement	SA	A	N	D	SD
RFID makes it easier to implement flexible manufacturing processes					
RFID increases the accuracy of and reduce the time spent taking inventories					
RFID improves reliable track and trace in challenging physical environments					
RFID increases efficiency and cut down on rework					
RFID improves the quality and transparency of data across the supply chain					

SECTION C: Enterprise Resource Planning (ERP) Systems as ICT Practice

To what extent do you agree or disagree with the following statements that reflect the use of Enterprise Resource Planning (ERP) Systems in logistics company? Please indicate the extent of your agreement or disagreement with each statement by ticking from **1 to 5**.

Enterprise Resource Planning (ERP) Systems Survey

Statement	SA	A	N	D	SD
ERP enables you to Manage your business with one system					
Newer ERP systems are upgrade-friendly					
ERP Systems streamline business processes					
ERP systems help you better analyze your business' data					
Meeting customer expectations					

SECTION D:

To what extent do you agree or disagree with the following statements that reflect the use of Material Resource Planning (MRP) Systems in logistics company? Please indicate the extent of your agreement or disagreement with each statement by ticking from **1 to 5**.

Material Resource Planning (MRP) Systems Survey

Statement	SA	A	N	D	SD
Inventory management is crucial to manufacturing efficiency					
Purchase planning streamlining the production process					

MRP systems detect bottlenecks in the production line caused by scarcity or a reduction of material					
Managers' use MPR information to control hourly operations, equipment and labour tasks.					
Information from the MRP system tells the manufacturer whether to hire or buy operational assets.					
MPR assist manufacturers in the generation, analysis and presentation of a tremendous amount of data.					
MRP systems economically optimise purchases with high precision, saving the manufacturer the cost of unnecessary purchases					
MRP systems are fully automated and require little human intervention					

SECTION E: Performance of Company Before the Adoption of ICT Practices

To what extent do you agree or disagree with the following statements that reflect the performance of your logistics company before the use of ICT? Please indicate the extent of your agreement or disagreement with each statement by ticking from **1 to 5**.

Performance (Before the adoption of ICT) Survey

Statement	SA	A	N	D	SD
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Our company's reputation improved in the eyes of the Customers.					
Employees' productivity was above the industry average.					
Relations with suppliers and customers were stable and excellent.					
Our company's return on assets (ROA, percent) was above the industry average.					
Sales growth in our company was at a faster rate.					
Our Company's liquidity ratio was above the industry average.					

SECTION F: Performance of Company After the Adoption of ICT Practices

To what extent do you agree or disagree with the following statements that reflect the performance of your logistics company after the use of ICT? Please indicate the extent of your agreement or disagreement with each statement by ticking from **1 to 5**.

Performance (After the adoption of ICT) Survey

Statement	SA	A	N	D	SD
Our company's reputation improved in the eyes of the Customers.					

Employees' productivity was above the industry average.					
Relations with suppliers and customers were stable and excellent.					
Our company's return on assets (ROA, percent) was above the industry average.					
Sales growth in our company was at a faster rate.					
Our Company's liquidity ratio was above the industry average.					

